DEPARTMENT OF COMMERCE

BUREAU OF STANDARDS

S. W. STRATTON, DIRECTOR

Weights and Measures

Eleventh Annual Conference

OF REPRESENTATIVES FROM VARIOUS STATES

HELD AT THE BUREAU OF STANDARDS

WASHINGTON, D. C., MAY 23, 24, 25, AND 26, 1916

WASHINGTON

GOVERNMENT PRINTING OFFICE

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APPENDICES 1 AND 2.

(Bureau of Standards Circular No. 61 and Technologic Paper No. 81 are reprinted and bound in at the end of the Conference Report.)

Appendix 1.—Specifications and tolerances for weights and measures and weighing and measuring devices, as adopted by the Eleventh Annual Conference and recommended by the Bureau of Standards for adoption by the several States.
Appendix 2.—Liquid-measuring pumps, by F. J. Schlink, Bureau of Standards.

REPORT OF THE ELEVENTH ANNUAL CONFERENCE ON WEIGHTS AND MEASURES OF THE UNITED STATES

HELD AT THE BUREAU OF STANDARDS, WASHINGTON, D. C., MAY 23-26, 1916.

FIRST SESSION (MORNING OF TUESDAY, MAY 23, 1916).

The conference was called to order at 10 o'clock a. m. by the chairman, Dr. S. W. Stratton, Director of the Bureau of Standards.

The CHAIRMAN. It gives me great pleasure to call to order this eleventh conference of weights and measures officials. Again we have with us the Secretary of Commerce, who welcomed you a number of times, and who has taken a great deal of interest in these meetings. The Secretary of Commerce.

ADDRESS OF WELCOME BY HON. WILLIAM C. REDFIELD, SECRETARY OF COMMERCE.

Dr. Stratton and gentlemen: There is always one thing of which you may be sure when you gather on Tuesday morning and hear the announcement that the Secretary of Commerce is going to speak to you, and that is that he will be brief, because it happens the Cabinet meeting comes at 11 o'clock on Tuesday morning, and it is necessary for him to be there, so you may always be certain of not being overloaded with his remarks so far as time is concerned.

I happened a few weeks ago to be in a small town in one of our Southern sisterhood States, and there a very strange thing happened right in your own line. A prominent official of the Government, whom you have all met and know, bethought himself that he would like that evening to have something made for his internal comfort from an article known as cheese, and he went about this small Southern town to seek this piece of cheese. He went into a store, whose proprietor shall be nameless, though well known, and there made the simple effort to buy 2 pounds of cheese. The proprietor was one of the men whom it is your duty to look after more or less, and he tried upon this particular person (of all the men in the United States out of 100,000,000 of us), to sell him a pound and a half of cheese for 2 pounds. He had a machine there which mechanically measured pounds—linear pounds, so to speak, pounds of distance—and when the Director of the Bureau of Standards, for it was no less than he upon whom this trick was played, remarked that that was not to his thought quite full 2 pounds, the storekeeper said it was what they sold for 2 pounds anyway. That, apparently, was just the trouble. The gentleman insisted that the pounds be weighed, which the dealer was most reluctant to do, and when he weighed them he did so with the dial of the scale turned toward himself and away

from the customer. Even that was not satisfactory to the gentleman concerned, who insisted that the scale be turned around with the dial outward facing himself. When that was done, as the incident is told to me, the dealer then endeavored to have a portion of his hand weighed with the cheese. Failing in that he was obliged to make good a half pound out of 2 pounds which he had not intended to furnish, somewhat to his own disgust. This has always amused me, and in quiet moments I have chuckled a great deal over that instance, to think that out of the whole United States he should take the Director of the Bureau of Standards and try to play that trick on him, and should so ignominiously fail.

That instance, to me, is an illustration of a very common thing which you and I, in large measure, exist for the purpose of stopping. I am interested in that thing because, as I intimated to you a year ago, that kind of trickery hurts worse where the hurt can least well be borne.

When it was my privilege some years ago to live for a good many months in France, my wife and myself were impressed, in going to the French markets, with the different way in which France is organized as compared with the United States. They have so arranged there that their entire marketing organization apparently caters to the needs of the smallest buyers. Of course, you all know the wonderful story of French thrift; if we had it, or anything approaching it, in this country, we would save not hundreds, but thousands of millions annually which now we waste. It is a wonderful story, the story of French thrift. The nation's markets are organized in accordance with it. Consequently, we found on going to the great markets of the city of Paris, we were offered not so much a chicken for sale, for example, as a piece of a chicken, the wing of a chicken could be bought, or the leg of a chicken, or a slice of a chicken, or a very small part like that, the whole marketing system being organized on the basis of the smallest possible buyer.

Lest you think I exaggerate by speaking only of one portion of that organization, I will go on this much longer to say that the great Bank of France, at the opposite end of the system, I think the largest bank in the world, is required by law to make loans on promissory notes of $1 and does habitually make them in that amount; it makes many loans of $2, and unless I am mistaken, makes the large majority in number of all its loans in sums of $20 and less. I speak of that to give you the impression of an organization prepared for the small man in a very effective way and one to which we are as yet, in this country, almost strangers.

The result of our lack of this organization is that our poorest people, the day laborers, the women who earn their own daily bread, are those upon whom the economic burden often falls most severely. They have to pay the highest prices per unit for what they get. An instance of that with which you are all familiar is that of the city tenement-house dweller who must buy in the wintertime his or her winter supply of coal by the basket full, or the single scuttle full, of coal, paying a rate per ton, for that reason, many times what any of us would think a very high price, three times, perhaps, or four times, or even more.

I am satisfied that social study would show that it is upon the very people for whom we provide least well in our organization of markets

that the burden, so far as there is one of wrongdoing in connection with weights and measures, falls most heavily; that they are mulcted at both ends of the line in the respect that they must, by reason of buying in petty units, pay high rates per unit, and upon them, the least able to protect themselves, the burden, so far as there is one, of fraud in weights and measures falls almost wholly—chiefly, anyway.

I spoke of this very briefly last year, and I speak of it again, because it is to me the great social value of the watchfulness which States and cities and the Government exercise over the weights and measures of the Nation. It is to make good and protect in some way those who have no other means of protection that you and I do a large part of our work, and it is infinitely well worth the doing. I wish we could get the vision of the woman and the man who, unable to tell for themselves whether things are rightly done for them or not by those whose interests lie the other way, must needs look to us for the help which we alone, through our various organizations, can give to them. I think that is a very valuable, profoundly valuable, civic and social service which men like yourselves, falling back upon the scientific work of this institution, can and do daily render.

I remember telling you a year ago what a great spectacle it was to see a mighty nation keep its temper, and I am glad now that I thought of that a year ago, because we can to-day look back a year and see how, under serious stress, we have still managed to keep our national temper. The Nation has not gone mad during the last year. There have been several times when it would have been quite easy to let indignation get the better of judgment, but I believe you all think, as the Good Book says, that "He that ruleth his spirit is greater than he that taketh a city," and that for America to have kept its head and its temper during the last year has been itself a great achievement. I do not speak of this as an achievement of the Government, but I speak of it as an achievement of the American people, that they as a whole have kept themselves in check when it was not altogether easy so to do. As a result of that I think we know that our national voice now is more respected and honored all over the world than it has been for long, because the neutral peoples understand, as well as the belligerent peoples, that we speak not from interest and not from wrath, but that we do utter the voice of right as we see it. It is a pleasure to recognize that right has been in very large measure conceded by those to whom our representations have been made.

You will find, since you came last year, there have been changes here. It is a habit of the Director of the Bureau of Standards always to push on the growth of this institution. You see the new building out yonder which was not here last year, and I imagine next year when you come you will see another one which is not here now. The way in which this service treats these matters reminds me of the girl who, with her father, entered New York City and stayed a few days recently, to whom said the father, as they left the town, "What do you think of New York, my dear?" and the child said, "It will be a very nice place, father, when they get it done." So here we are not done. We wanted to have all these lawns in beautiful shape for you that you might compliment us on our horticulture, but so long as they will go on building chemical laboratories and radio laboratories and others that are to come, I do not know whether we shall

ever have the grass around this place as nice as you think it ought to be. But still it does speak this: As you come here from distant places and so express your confidence in our work and in its help to you, so I am proud to say for Dr. Stratton, what he will not say for himself, that he has in a peculiar measure the confidence of Congress, that the men of both parties in both Houses trust him, and appreciate his work, and it is for that reason, because they are liberal in the appropriations for the support of this great and growing work, that you see this constant disturbance which, under the circumstances, we will ask you to forgive.

You know without my telling you how glad we are to have you here. I wish there were a lot more of you; I wish this room was far too small to hold you all. We look for the time to come when every important city and every State in the country shall be here represented and shall come because they learn that which is helpful to them; I hope you will find all the fault you can with what you do not see as well as with what you do see. It is the things which are left undone, and which are not visible to the eye, that are the most important to have done. I remember, as a salesman going into foreign fields, looking constantly not for the thing which was done which somebody else was looking after always, but for the thing which was not done which I might look after to my own profit. So here, you coming with a fresh vision and unaccustomed to this particular atmosphere in its daily routine, may see things which would be helpful in your locality if they were done. Say so frankly and fully, because we learn from what we hear from others.

Now, if you will pardon my having to go somewhat unceremoniously, remembering, if you will, that I go with the spirit of earnest enthusiasm for your work, believing in it, believing in you, believing that the country is better because you are in it and doing a good job in behalf of those who can not do it for themselves, I will say good morning to you all.

REMARKS BY THE PRESIDENT, DR. S. W. STRATTON, DIRECTOR OF THE BUREAU OF STANDARDS.

There is very little I can add to the secretary's welcome. I do want to extend to all of the members present a most cordial invitation to see the working of the Bureau of Standards. Remember that, from the beginning, I have constantly taken the position that your duties and functions would sooner or later extend over much broader ground than they do at present; that you would be called upon to serve in an advisory capacity in many things which do not now immediately concern you. You would be surprised at the large amount of that work done here at the bureau. Many times the requests that come in are for things that we perhaps can not do, but we can tell where these things can be found, and indicate the literature on the subject, and in many ways be helpful, by merely suggesting the outline to be followed. This is bound to be so in your own cases, and we wish to make the bureau as useful as possible in that respect; we wish you to be familiar with the bureau's work in all of its lines, so that when these requests do come, and when you meet people who wish information in other lines, you can get it from the bureau or refer them to the bureau.

This is a field besides your own immediate field in which you can be of the greatest assistance in making the bureau useful to the people, and in so doing make your own position more important and more useful as well.

I am very glad that you can be with us to-day and that, as these meetings go on from year to year, there is a decided improvement in the technical nature of the matters discussed. We hoped in the beginning that these meetings would be a clearing house for all matters pertaining to weights and measures, and that the newcomers who appeared from time to time would confer with others and would find what has been done in other places; and, on the whole, the good work in weights and measures will be promoted throughout the country more rapidly and more efficiently because of these meetings.

There is a great deal that I might say, but it will come out as the meeting progresses. The program has been carefully arranged, but it is not at all necessary to confine ourselves to this program. A number of gentlemen already have asked if it will be possible to take up certain different subjects. My reply has been that during the meeting a time will probably be found for the discussion of all these matters which appear to be of interest to us. The next item on the program is the report of the secretary.

The SECRETARY. Mr. Chairman and members of the conference, after having carefully prepared my report last evening I left it on the street car and so I am going to ask you to let me postpone that until I can recover the papers I wish to present to you.

The CHAIRMAN. I shall call for the reports of the State delegates. Is there a representative from Arizona?

REPORTS OF STATE DELEGATES.

ARIZONA.

By O. N. CRESWELL, *State Inspector of Weights and Measures.*

This is the first time that Arizona has been represented at any of these conferences. It is a great pleasure for me to meet the men who are engaged in this important work. I trust that this coming together will result in much benefit to all of us.

Arizona enacted a weights and measures law shortly after coming into the Union as a State; this law has now been in operation about three and one-half years. Our law provides for an inspector, who is required to make inspections once a year in all cities and towns with a population of over 900 and not over 5,000. In cities of over 5,000, city sealers are appointed by the common councils of the city. These city sealers are required to perform other duties in addition to the sealer's work, which to a certain extent is a detriment to the weights and measures department.

However, I am pleased to report that the weights and measures conditions have greatly improved during the past year. Especial attention has been given to the inspection of commodities, which is just as essential as a proper supervision and inspection of the weighing and measuring devices.

Since the last conference there have been no changes made in our law. When the next legislature convenes this department will again

recommend the elimination of all fees for inspection work; also that a change be made so as to permit the State inspector to name a sufficient number of deputies to make inspections in all parts of the State, or to name a county inspector in each of the counties who shall be appointed and be under the supervision of the State inspector.

CALIFORNIA.

By CHARLES G. JOHNSON, *State Superintendent of Weights and Measures.*

We have just finished our first year of actual work in California and it has been a most interesting year. It is the first year that inspection of weights and measures has ever been carried on in the State, and naturally the first year was perhaps harder than any we will encounter in the future.

During the past year we were forced by conditions to take out of the avenues of trade a little over 286,000 pieces of apparatus. During the entire procedure we have not heard of one suit or any contention whatever between the department and the people whose property was confiscated. We aimed to give to the merchants and the people accurate weighing machines, and then it becomes our province to endeavor to keep those merchants and machines accurate and honest. We have at the present time a force of 82 men, who are working intelligently and industriously, and we hope to continue to make our work more and more useful and of greater benefit to the people of the State.

The CHAIRMAN. That is an example well worthy of following. A force of 82 men in the first year is highly commendable. I think that that might be taken as a model for some States that have not yet begun.

CONNECTICUT.

By THOMAS F. EGAN, *State Superintendent of Weights and Measures.*

Mr. Chairman, I have the honor to represent Connecticut at this conference. There is not much for me to report with regard to the weights and measures work in our State. In 1915 I made a report here of such changes as we had secured in our weights and measures law. The proposed increase of salaries for county sealers has brought about some changes of officials since the representatives from some of our counties have neglected to appoint county sealers, or to make provision for their salaries. As a result of that neglect or oversight we have at the present time only two county sealers in our State who are attending to their duties. The city and town sealers are all active and doing good work. We have with us at this conference one county sealer, Mr. Brown, of Fairfield; we also have Mr. Kelly, the city sealer of Bridgeport; Mr. Maroney, the city sealer of New Haven; Mr. Frank, the city sealer of Waterbury; and no doubt other city sealers and officials from our State will come here either to-day or to-morrow.

With regard to the weights and measures work, I may say it is going along as usual. All of the officials from whom I have reports are doing very good work, the people are interested and they keep up the appropriation for us, though our appropriation was cut

down somewhat because of necessary economies that had to be practiced at the last session of the legislature.

There is not anything further that I have to say. I have come here for enlightenment with regard to our work in which we are all interested, and not so much to talk as to listen.

DISTRICT OF COLUMBIA.

By Leo S. Schoenthal, *Assistant Superintendent of Weights, Measures, and Markets.*

Mr. Roberts, the superintendent of weights and measures, will be here soon. The only thing that I can say is that we are all keeping at the work and we are trying to give service. We are not paying so much attention to the number of inspections as we are to the character of inspections. While we have not been successful in getting any new legislation, or in getting any increase in force to speak of, at the same time we have held our own and we believe that we are now better equipped than we were when here a year ago. We have hopes that this Congress will give us something, although we do not know that they will.

I might state that during the past year we have had a change in the administrative head, John H. Sherman having resigned to go to New York. Mr. Sherman was succeeded by George M. Roberts.

The Chairman. The last speaker has suggested something that would be well for the State delegates to speak of, and that is to point out the progress since the last meeting, especially any changes in legislation.

ILLINOIS.

By Lewis G. Stevenson, *ex officio State Sealer of Weights and Measures.*

Mr. Chairman, I have heard one or two of the delegates refer to the honor they feel in representing their States. I can hardly say that I feel it a great honor to represent Illinois in this conference, for the reason that Illinois is about the least progressive in the matter of weights and measures of any State in the Union of which I have knowledge. The secretary of state is ex officio State sealer. During my term of office as secretary of state, I have been called upon but once to act in that capacity, and that was when a county clerk sent down a quart measure and wanted to know if it was the right size. The law is really a dead letter in the State of Illinois and nothing at all has been accomplished.

During the past year a number of amendments were made and several new sections were added to the State law at the instance of Gov. Dunne. They were drafted by the Chicago department, under the direction of Mr. Cluett, to whom the State is indebted. There was an amendment which gives statutory weights per bushel for about 75 articles. That, I believe, is about the first legislation for a period of 10 or 12 years.

Another section gave the local committees and the president of boards of trustees of incorporated towns the right to pass ordinances requiring the sale of fruits and vegetables to be by standard avoir-

dupois weight. That is at least making some progress. Other than that nothing has been done. However, we have sealers, I think, in 8 or 10 towns.

The city of Chicago has made very satisfactory progress. I feel that the agitation which these conferences have aroused, and the newspaper prominence given to the work in Chicago, will result in the next assembly accomplishing something of material good. As you recall, during the last assembly we had a seven weeks' speakership fight, we had a wet-and-dry fight, we had the waterway fight, we had the public utilities fight, and, as a matter of fact, the assembly was busy from start to finish, and while we had in view the accomplishing of something in the way of weights and measures standardization, nothing was accomplished.

I believe, from the way you have started the ball rolling, that next year or the year following we can closely approach California. I thank you.

The CHAIRMAN. I will say, Mr. Stevenson, that not very long ago we had as a visitor in the bureau a very active and prominent member of your State legislature. I went over the whole situation with him and told him how embarrassed we were at times that Illinois had never taken steps in the matter of weights and measures legislation, and he promised to take the matter up and devote his entire attention to it at the next session of the legislature. Before you go I will put you in touch with him and I feel sure you will find him of great assistance.

INDIANA.

By J. T. WILLETT, *Chief Inspector of Weights and Measures.*

Mr. Chairman, we have not had any new legislation in the last two years in Indiana. We hope, however, at the coming session to introduce a number of bills which we trust will strengthen the weights and measures department of Indiana. We have about 21 departments which are very active, but under the present law we can not go very far. Therefore, unless we get more legislation the weights and measures business in the State will not progress as it should. I do not know of anything else that will be of interest. I thank you.

IOWA.

By EDWARD C. LYTTON, *Chief State Inspector of Weights and Measures.*

Iowa has not been in the weights and measures work as long a time as the older Eastern States. However, we are now doing some effective work, although the number of men at our disposal makes it impossible to do the work as thoroughly as it should be done. Iowa has three men giving their entire time to this work. The food and general inspectors give some time to the inspection of counter scales and measures and to the checking of commodities to ascertain whether full weight and full measure are being given.

We realize more and more as we get into the work the necessity for uniformity and cooperation between the States.

I hope that we may be better equipped and have a more complete report at the next annual meeting.

MASSACHUSETTS.

By THURE HANSON, *State Commissioner of Weights and Measures.*

During the session of the Massachusetts Legislature much constructive legislation has been enacted relating to weights and measures and the sale of different commodities, although it is a matter of regret that the proposed general codification of our weights and measures law has again been postponed.

Among the more important laws enacted at this session are chapter 120, general acts of 1916, relating to itinerant vendors, and the amendments to the hawkers' and peddlers' law which make that law much plainer and more easily enforcible.

The law defines an itinerant vendor as "Any person, either principal or agent, who engages in a temporary or transient business in this Commonwealth, either in one locality or in traveling from place to place selling goods, wares, and merchandise, and who, for the purpose of carrying on such business, hires, leases, or occupies a building or structure for the exhibition and sale of such goods, wares, and merchandise." The building or structure may be a store, a hotel room, or a public hall, etc.

Before commencing business every itinerant vendor, whether principal or agent, must secure a license from the commissioner of weights and measures, paying a State license fee of $25 therefor, and must also make a special deposit of $500 with the commissioner.

This license does not authorize more than one person to sell goods under it, although a licensee may have the assistance of one or more persons in conducting his business who may aid him but not act for him or without him.

Before selling under a State license every itinerant vendor must pay a local license fee to the clerk of the city or town in which he proposes to make sales.

The mayor, or aldermen or selectmen or other board authorized to issue such licenses may require the payment of a fee equal to the taxes assessable in said city or town under the last preceding tax levy upon an amount equal to the valuation of the stock kept or intended to be kept and exposed for sale, or they may grant such license upon the payment of a license fee fixed by them. The clerk shall record the State license of such vendor in full, shall indorse upon it the words, "local license fees paid," and affix the date and his official signature.

Before advertising, representing, or holding forth any sale as an insurance, bankrupt, insolvent, assignee's, trustee's, executor's, administrator's, receiver's, wholesale, or manufacturer's wholesale or closing-out sale, or as a sale of any goods damaged by smoke, fire, water, or otherwise, an itinerant vendor must state under oath to the commissioner of weights and measures all of the facts relating to the reasons and character of such special sale, including the names of the persons from whom the goods were obtained, the date of delivery, the place from which said goods were last taken, and all details necessary to exactly locate and fully identify all goods to be so sold.

The deposit of $500 made with the commissioner of weights and measures shall be subject to attachment and execution in behalf of the creditors of the licensee whose claims arise in connection with

the business done under his State license. Said deposit shall also be subject to the payment of any and all fines and penalties incurred by the licensee through violation of any provisions of the law relating to itinerant vendors. The commissioner shall hold the special deposit for 60 days after the expiration and return or surrender of each State license, and, after satisfying all claims made upon the same under the provisions of the statute, shall return the balance to the licensee.

For neglect to file a statement of quantity and value of stock with the mayor, or aldermen or selectmen or other board authorized to issue local licenses, if required, or for making a false or fraudulent representation in such statement, a fine of not less than $5 or more than $20 for each day during which such goods, wares, or merchandise are kept or exposed for sale, may be inflicted.

For selling or exposing for sale, at public or private sale, any goods, wares, or merchandise without State and local licenses therefor, properly indorsed, or for filing an application containing any false statement, or, being licensed, for failing to comply with the requirements of the law relating to sales represented as insurance, bankrupt, etc., or for advertising unlicensed sales in any manner, a fine of not more than $50 or imprisonment for not more than 60 days, or both fine and imprisonment, may be inflicted.

The first enactment of the existing statutes relating to hawkers and peddlers occurred in 1846, at which time all previous legislation upon this subject was repealed. Since that time numerous amendments and additions have been necessary, the Supreme Court having ruled that many of the provisions of the statute were unconstitutional.

In the amendment of different sections at more or less frequent intervals there had apparently been no attempt at a comprehensive revision of the entire statute, the result being an apparent conflict between different sections which added to the difficulty of their construction and enforcement.

By the provisions of chapter 253, general acts of 1915, the authority to issue hawkers' and peddlers' licenses, and the general enforcement of the law relating to the subject, was transferred from the secretary of the Commonwealth to the commissioner of weights and measures.

The general enforcement of the law by this department revealed many points of weakness in the statute and emphasized the necessity for its revision; and the amendments now made are the result of careful study of the existing laws in this and other States and the experiences of officials charged with their enforcement.

The description of the persons excepted under the old law was so uncertain that it has been almost impossible to agree upon the proper construction of the phrase "selling agents to dealers in the usual course of business." The amendment simplifies the meaning of that phrase and renders its proper construction less difficult.

It was formerly provided that fines imposed should be equally divided between the county and the complainant. Under more recent statutes, when the complainant was an officer whose duties included the enforcement of the law, such complainant could not receive any part of the fine, and the total amount was paid over to the county. Under the amendment which provides that one-half of the fine shall

go to the city or town in which the offense is committed there will be a greater incentive for local officers to enforce the law.

Furs have been included in the list of articles the sale of which by hawkers and peddlers is prohibited.

Fish has been included among the commodities for the sale of which cities and towns are permitted to require a license.

In some cities badges issued to minors by the school committee are held to authorize the sale by such minors of all kinds of merchandise, when the evident intent of the legislature was to authorize the sale of such articles only as might otherwise be sold without a license. At the present time many minors wearing this badge are selling various articles in competition with adults who have paid a license fee for the privilege of selling similar articles. This condition will not be possible under the amended law.

The law as amended provides that the commissioner shall collect all fees at the time a special city or town license is granted and that he shall pay over to the cities or towns the amounts due to them under such licenses. Under the law as it read in the past the licensee paid $1 to the commissioner and was supposed to pay to the treasurer of a city or town an additional amount, based upon population, before he peddled in such city or town. As a matter of fact, in some cases licensees peddled for a long time before paying the fee to the city or town, and sometimes this fee was never paid.

The principal purpose of the county license appears to have been the regulation of the sale of tin, brittania, earthen, wooden, and other wares from the old-fashioned "tin peddlers" wagons. This mode of trading is now nearly obsolete, and county licenses have been generally secured by the applicant ostensibly for the sale of "goods, wares, or merchandise manufactured by himself or his employer," but in many cases these licenses were actually used in the sale of other goods which should have been sold under a State or special city or town license, thus depriving the Commonwealth and various cities and towns of license fees which rightfully belonged to them.

Of 833 county licenses issued in 1914, it is safe to say that 75 per cent were used in the sale of articles other than those properly covered by this form of license. In one day nearly 30 peddlers of laces, embroideries, table cloths, etc., were apprehended by officers of my department and required to take out State licenses, paying the license fee of $50 therefor. In previous years these peddlers had traveled under county licenses, for which they paid $1 to the State and $4 to the county.

The amended law will cover conditions as they exist to-day and will help to eliminate fraudulent use of county licenses.

The former statute provided that the commissioner should be notified by the clerk of the court whenever a licensee was convicted of any crime, but it made no provision for such notification when any person, other than a licensee, was convicted of violation of the provisions of the law. The amendment will remedy this defect.

The provision that every licensee should post his name, residence, and license number upon his parcels or vehicle is impracticable in the case of foot peddlers carrying packs or exposing goods for sale in their hands or in baskets. At the present time the majority of wagons or other vehicles used by peddlers are not marked as re-

quired by law. The amendment which authorizes the commissioner, at the expense of the licensee, to furnish badges for foot peddlers and plates or tags for wagons or vehicles used by peddlers would tend to remedy this condition. The use of these name plates and badges is important, as they will furnish a ready means of identification if a peddler gives cause for complaint, and the provision that the licensee shall indorse his usual signature upon the license will provide an additional safeguard against the use of licenses by persons other than the licensees.

The amendment imposes a penalty upon any person who has in his possession another's license with intent to use the same. This would stop the trafficking in licenses which is believed to exist at present. A considerable number of licenses are annually reported as lost or stolen, and rarely, if ever, are any of these recovered. It is fair to presume that these licenses are in use, and such illegal use should be discouraged by penalizing the possession of another's license with intent to use.

Other laws enacted at this session are chapter 44, General Acts of 1916, which authorizes the commissioner of weights and measures to establish district offices in various sections of the Commonwealth;

Chapter 63, amending the law relating to the packing and grading of apples;

Chapter 149, relative to untrue and misleading advertisements;

Chapter 151, which requires that containers furnished by the purchaser of milk at wholesale shall be sealed and their capacity plainly marked thereon on petition of the seller to a sealer or deputy sealer of weights and measures;

Chapter 154, which requires that range boilers have the capacity plainly marked thereon, together with the maker's business name and his guarantee that it has been tested to not less than 200 pounds hydraulic pressure to the square inch;

Chapter 157, which exempts from the provisions of the old law bread which is sold in wrapped or package form, having the net quantity of the contents plainly and conspicuously marked on the outside of the covering or container; and

Chapter 188, authorizing the overseers of the poor in a city or the selectmen in a town to grant temporary licenses to sell flags, badges, medals, buttons, flowers, souvenirs, and similar articles for charitable purposes.

MICHIGAN.

By Burr B. Lincoln, *Deputy Dairy and Food Commissioner, in Charge of Weights and Measures.*

Mr. President, I have not anything of especial interest to report. We are alive in Michigan. We have 32 county sealers and in our department six men who work more or less in weights and measures, and we make a very close examination of scales, as the scale men here will probably tell you. We also make examinations along other lines, from the counting of tacks to the testing of gas meters. Considering the small appropriation we have and the small force, we cover quite a lot of ground. Last year we went up against the paint

people. I found that about 50 per cent of the cans were short. That might be a tip for some of the other State weights and measures officials. We can not compel the marking of packages, but I regulated the matter from the standpoint of custom, since paint has always been sold by measure.

Last year we had the test car of the Bureau of Standards spend a month in our State. I want to thank the bureau for sending the car, which is a very fine one. Out of 30 scales tested they recommended that 18 be replaced. So the car has done great good in our State. I also want to say that they had a very fine, gentlemanly crew with the car.

We did not have any session of the legislature last winter, and consequently have had no new legislation. We have one man in our department who spends nearly all of his time in educational work, and he has just wound up a campaign in Detroit. He and the city sealer of Detroit had an exhibit which they could load on to an automobile and take from one school to another and spend an hour before the whole class giving a lecture on weights and measures. I regard that as fine educational work. This summer the man will spend his time before the housewives' leagues, and I also regard that as one of the most important works the department can do. I do not know that I have anything else of interest to report.

The CHAIRMAN. Mr. Lincoln has mentioned a subject in which we are very much interested, namely, the inspection of the track and other large scales. It has been the policy of the bureau to undertake this work in cooperation with the State officials and, in fact, I might say that when we go into a State we put ourselves at the disposal of the State department. The inspection in a State is really made by the State official. From the beginning the bureau has taken the attitude that our first effort should be to help the State officials to help themselves and to do whatever we could toward furthering their own work.

MINNESOTA.

By P. D. MCFARLANE, *Scale Inspector, State Grain Inspection Department.*

Mr. President and gentlemen, I am very much pleased to be with you at this eleventh annual conference, and I regret the absence of our commissioner of weights and measures, Mr. C. C. Neale, who through press of important business was prevented from attending. I am not familiar with the many details carried on by the commissioner's office, but I know there has been material progress.

The department of weights and measures has brought out specifications and tolerances which were adopted by the Minnesota railroad and warehouse commission, to whom our State legislature delegates the power of enforcement of the weights and measures laws in Minnesota.

We are all justly proud of the last annual report made by Commissioner Neale, and I am sure he will be pleased to send a copy of this report to those of you who may be interested.

Gentlemen, I thank you.

NEW JERSEY.

By WILLIAM L. WALDRON, *State Superintendent of Weights and Measures.*

Mr. Chairman, we take weights and measures work seriously in New Jersey, and for that reason I feel we are continually progressing. The laws on this subject in our State are of the best. Every county in our State has one or more officials, all the large cities have well-organized and well-equipped departments, and every man in our State receives a good salary, and in addition to that he has the assurance that he can not be removed from office except for cause. Peace, good will, and harmony prevail among the men, which is conducive of good results.

Since the last conference we started the inspection of drug stores in New Jersey. I now refer to the small weights and delicate apparatus used in the compounding of prescriptions, and the result of this work has disclosed the need of it. We find the same percentage of inaccuracies in this that we find in other lines. We are now making inspections in hospitals, sanitariums, and manufacturing plants where similar equipment is being used.

I want to thank the Bureau of Standards for the use of its standard test car. This car remained in our State for a considerable time, and while there made a thorough test of all important track scales in our State. The car was in charge of Mr. Boyer and two assistants, and they deserve to be complimented on the courteous way in which they cooperated with us.

As I have mentioned, every man in our State is protected by the act of the legislature except myself. In the early part of this year one of the county officials was removed for political reasons. A meeting of the association was called and it was the unanimous opinion of the members that we test this case in the courts. I was instructed to obtain counsel, and each man pledged himself to pay a proportionate share of the cost of the trial. The opinion will be handed to us next month, and, for those who have a similar law, I will be glad to send a copy of the opinion here and one to the Scale Journal so that those interested will be able to see the result. I thank you.

The CHAIRMAN. I want to express my appreciation at the great pleasure I had in attending two State conventions last year. In the beginning we had hoped that this organization would bring about an organization in each State. While our people have attended those I have not had the pleasure of attending many until last year, one in Pennsylvania and one in New Jersey, and I was delighted to find the serious manner in which these people took up the technical questions involved in their work.

At the meeting in Pennsylvania the various sealers were comparing notes and checking up the various questions that concerned them. In Mr. Waldron's meeting at Atlantic City the delegates were full of enthusiasm; they were giving experiences entering into their work to an extent which I had hardly dreamed of. I have not had anything give me as much pleasure in connection with weights and measures in years as the attendance upon these two meetings.

NEW YORK.

By JOHN F. FARRELL, *State Superintendent of Weights and Measures.*

Mr. Chairman, the department in New York State still is engaged in building the structure on a foundation so practically and wonderfully laid by Dr. Reichmann, and the report of the State is progress. We are gradually becoming familiar with the laws, gradually learning something about the great questions of weights and measures, and we hope eventually to have in the State of New York a weights and measures department which is as near perfect as humanity can achieve. We have not started on any trimmings as yet, or any embellishments, but we are still in the practical stage of erection, still in the stage of learning. We hope eventually to know something about weights and measures in the State of New York, and then we will start after some of those things which bother us at present in regard to the manufacture of scales.

The whole question of weights and measures in the State has been taken hold of by all different sorts and kinds of societies and associations and they all seem to be much interested in the subject. The womens' societies especially have become interested in the subject from the practical side of the saving to their individual members, from which savings they buy new gowns and new hats.

Last year the legislature passed no bills governing weights and measures although there were introduced some few bills devoted to that cause. Next year the department hopes to take the whole weight and measure law and make it as near the ideal as is suggested by the conference here as possible.

The individual inspectors of weights and measures are doing their work wonderfully well. We are trying to get away from the word "sealer," as it means nothing, and in the new law I do not think the word "sealer" will appear, but it will be "inspector" instead. The great work of the officials in the State is not confined to sealing the scales but is in keeping the storekeepers informed in regard to their scales. I hope during the convention to tell you something of the practical side of the subject in some of the discussions that come up. The report of the State is real progress.

The CHAIRMAN. Mr. Farrell has made a remark that seems to me very pertinent. I have never liked the term "sealer." That word seems to me to be the smallest we could use in connection with the whole work. Personally I would like to see the word eliminated from our nomenclature. I do not know whether you agree with me, but I personally agree with what Mr. Farrell has said in that connection.

OHIO.

By JOHN M. MOTE, *Assistant Chief State Inspector of Weights and Measures.*

I am very glad to say that the work in Ohio is going along very nicely. At the beginning of 1916 eight counties in Ohio were without sealers, and at the present time we have sealers in every county of the State except three. The work of testing the apothecary scales was taken up along about March 1, and I was very much interested in what the gentleman from New Jersey had to say. I will say that in our State we found on an average that about 31 per cent of the

weights tested were bad and we condemned them. Of course that probably comes from the fact that they had never been tested previously.

The testing of gasoline pumps has been going on. The State department required every city and county sealer to make a thorough inspection of all pumps in his territory and to report by May, 1916, and the summary of the report so far received shows that about 15 per cent of the pumps in use were either corrected or condemned.

The law in Ohio compelling the selling by weight was held unconstitutional by the supreme court. For that reason many seemed to believe that they were not compelled to use a standard measure or to comply with the weight per bushel laws of Ohio, so a law was passed providing for measures of certain dimensions. This law was also attacked in the courts. It was upheld by the supreme court in a decision handed down about two months ago, but the parties concerned are now contemplating taking it to the United States Supreme Court.

The legislation in Ohio has not been altogether pleasing to the State department since the county sealers are appointed by the county auditor, and their salary is named by the county commissioners, and they work under the direction of the State department, so each and every county sealer in the State of Ohio considers he has about five bosses. We hope, however, to be able to get some new bills introduced and enacted into law at the coming session of the legislature and to take a few other progressive steps in the weights and measures work.

PENNSYLVANIA.

By James Sweeney, *Chief of the State Bureau of Standards.*

I have the honor to represent the Commonwealth of Pennsylvania, one of the greatest States in the Union; not only great in its industrial and commercial life, but in the character of its laws in the interests of its citizens, which demonstrates its greatness in statesmanship. One of the most important of these laws to the whole people is the weight and measure law enacted in 1911. It is gratifying to note the progress that has been made in the short period in which we have had laws governing the subject of weights and measures in Pennsylvania. There is no question affecting the commercial relations of the people of our State upon which every one agrees with greater unanimity than that the giving of short weight and measure is a great wrong and detrimental to sound business principles. Even the small percentage of those who practice deception in their business relations with the people have come to realize that the practice is contrary to sound business principles, and that aside from the penalties which are imposed by the law for violations of its provisions, the practice of giving short weight and measure is not a profitable one.

When we come to consider the many obstacles that confronted the inspector of weights and measures when he first began the work of inspection and the almost universal opposition to any law that would interfere with a system that had been in operation for generations, we have every reason to feel grateful for the remarkable progress which has been made. This progress is due, in a large measure, to

the cooperation of all classes of merchants in the enforcement of the law. The enactment of this legislation was not intended solely for the purpose of protecting the consumer, but was intended to protect the honest merchant as well. There were many merchants who always endeavored to give to the purchaser full weight and measure. These merchants were compelled to compete with the dealer who always endeavored to increase his profits by giving short weight and measure. The enforcement of this law removes that competition and gives to the honest merchant this same protection that is guaranteed to the consumer.

As the State bureau of standards was not equipped to verify weighing and measuring devices used by inspectors until October, 1911, there were no inspections reported to the bureau for that year. In the year 1915 throughout the State of Pennsylvania there were 570,531 inspections of weighing and measuring devices that are used in weighing and measuring the various commodities that enter into the daily life of the citizens of our Commonwealth. Seventy-one thousand of these devices were condemned, as they were defective and did not conform to the State standards.

In addition to the weighing and measuring devices which are inspected, there were inspected 257,389 containers, such as packages, milk cans, crates, boxes, baskets, bags, etc., which are used in the sale of commodities. Of those containers 18,039 were condemned as unfit for use, thus removing the danger of the purchaser receiving less quantity than he or she was paying for.

The inspection of packages and containers of all kinds was necessitated by the passage of the net-container law, which requires that all goods sold in a container or package of any kind must have the net quantity of the contents plainly and conspicuously marked on the outside of the container or package in terms of weight, measure, or count. Previous to the passage of this net-weight law the purchasers were required to pay for the materials composing the package or container in which the commodities were sold, and which were of no value to them. This law therefore protects the purchasing public from the sharp practice of imposing upon the public by selling them something which they could not use.

PHILIPPINE ISLANDS.

By C. H. Loeber, *Chief, License Division, and Sealer of Weights and Measures.*

Mr. Chairman, in 1907, the legislature passed a law establishing the metric system in the Philippine Islands. Prior to that we had the Chinese system of weights and measures, the Spanish system, and also the English system. Since that time we have been very successful in improving the weights and measures conditions.

There are over 800 municipalities in the Philippine Islands, and in each municipality there is a municipal treasurer who is also an inspector of weights and measures. The bureau of internal revenue is in charge of the enforcement of the law. The duties of the internal revenue agents take them into every store in the Philippine Islands, and among their duties is that of inspecting weights and measures.

There are about 25 Americans and about 60 Filipinos in the bureau who do outside work; each of these employees is under civil service, and also the municipal treasurers are under civil service and hence they are not removed by a change of administration.

Before the men are sent out into the Provinces they are given thorough instruction in the handling of weights and measures. The only thing not sold in bulk is stuff imported into the country in the original packages, and these have to have marked on them the net weight.

The most numerous frauds committed are with spring balances. We confiscated over 600 out of 1,000 balances presented for sealing in Manila last year, among which were several new balances, and this has led certain importers to stop importing the spring balance. The type I refer to is that commonly called the family scale, which usually sells for about $1.25 or $1.50 retail over there. Another way of defrauding in the Philippines is by the use of a measure in selling rice which holds 3 liters. They fill the measure to the brim and use a stick to strike off the surplus, and frequently they concave the stick so that it strikes off too large an amount. One Chinese was offered the alternative of compromising a case with the government or taking his chances in court. He preferred the latter. They fined him $100, and he appealed to the supreme court, and the supreme court upheld the decision of the court of first instance and stated that while the amount the customer was defrauded of did not amount to much, in the whole it represented a considerable amount.

Conditions in the Philippines are very good. The men are out all the time, and the number of compromises in the course of a month will run from 10 up to 100, and the amount of money collected in fines and compromises will amount to several thousand dollars in the course of a year. That is all I have to say.

The CHAIRMAN. I would like to ask the gentleman if the balances shipped to the Philippines are all graduated in the metric system?

Mr. LOEBER. Everything we have is in the metric system.

The CHAIRMAN. Is there a tendency to displace the metric system because of the large number of imports from this country?

Mr. LOEBER. No. The only articles imported from this country are in cans. The majority of the articles imported from Europe are imported under the metric system because that system is universally used throughout Europe.

The CHAIRMAN. Is attention paid to the package goods and other commodities where the net weight is marked in pounds?

Mr. LOEBER. Yes, sir. We check them up. We weigh them, and if we find out that a dealer is defrauding the public we get after him. For instance, if a package states a pound the dealer has to give a pound in weight.

The CHAIRMAN. Then you keep a set of avoirdupois weights as well?

Mr. LOEBER. No, sir. We reduce it down to the metric system.

The CHAIRMAN. You do not think that tends to break down the metric system?

Mr. LOEBER. No, sir.

The CHAIRMAN. It has been claimed in Cuba and in the Philippine Islands and Porto Rico that sooner or later the importation of foreign goods would break down the metric system.

Mr. LOEBER. The only articles imported are canned goods, peas, corn, etc. At the beginning of the year we compelled the jewelry dealers to adopt the metric system.

The CHAIRMAN. Can you tell me about the purchases of our War Department?

Mr. LOEBER. We allow them to purchase in pounds, but the dealer has to report the sale under the metric system.

The CHAIRMAN. To what extent does that affect the purchasing in the country of food that the War Department buys itself, which is on the pound system?

Mr. LOEBER. They buy from the importer and he turns it over direct without breaking the package.

The CHAIRMAN. I have always felt that it was hardly fair to have our own Government departments go in there and use another system of weights and measures than the metric system. I have always felt that the War Department should accommodate itself to the metric system rather than insist upon our own. Of course there are reasons why they do it.

Mr. LOEBER. We have found the metric system very successful over there and the people are being educated right along, and in the markets we have inspectors to check up the dealers.

The CHAIRMAN. Was the metric system in use there before the change in the government?

Mr. LOEBER. No. It was adopted in 1907. Prior to that they had the Spanish libra, which is more than an avoirdupois pound, and they had the Chinese catty. A person would ask for an American yard or for a meter. Now they are obliged to buy by the meter. Everything is sold by the meter. A person buys a liter of oil or a kilo of potatoes or 5 kilos of rice. Coal is sold by weight.

Mr. REICHMANN. The Americans who come over there presumably have the same amount of intelligence as the native Filipinos and do not require much time to become accustomed to the metric system, do they? That is an important question from the standpoint of the opposition to the metric system in this country. It is said by some who oppose the metric system here that it would take the American people too long to learn this system. How long does it take the average American to become acquainted with the metric system in the Philippines?

Mr. LOEBER. They have to learn right away because it is the only way they can buy.

Mr. REICHMANN. And they get used to it right away?

Mr. LOEBER. Yes, sir; at any rate in a month or two.

The CHAIRMAN. I feel that sooner or later the matter is going to come up here. I think we make a great mistake in underestimating the intelligence of our ordinary workmen.

We have usually been given credit for the metric propaganda, but never in a single instance has it originated here, although we are entirely favorable to it.

It has often been said that the workmen could not do their work in the metric system and it would take millions of dollars to make the change, and so on, and when it was suggested to the opponents that the workman could learn it in a short time and all that was

necessary was to give them the measuring instrument, it was said that was purely academic and only the talk of scientific men.

Let me tell you what happened since that time: I suppose dozens of times since, the Baldwin Locomotive Works have received orders for locomotives designed under the metric system and in each case they have put the directions in the shop and given the workmen metric instruments to measure with, and an official of the company told me that the workmen like it and prided themselves on the fact that they could work in the metric system.

A few days ago I saw the head of the American Locomotive Works, and it appears that the same thing happened with them. The same thing has happened in the making of munitions. Nevertheless, there is a good deal of opposition, and I have sometimes thought if we could do as they have done in the Philippines and in other countries—that is, introduce it in the beginning in the several affairs of everyday life—the future would take care of itself. Let manufacturers build machinery in the old way if they want to until they find it is not an economical thing to do. But the metric system ought to be considered very seriously from the standpoint of common affairs of everyday life. It is much more far-reaching than many of us think, and it has a great deal to do with educational matters and with many other matters.

PORTO RICO.

By R. Siaca Pacheco, *Assistant Secretary of Porto Rico.*

Mr. Chairman and gentlemen, I have come from the distant island of Porto Rico to attend the sessions of this important conference as the representative of the Porto Rican service of weights and measures. Although I am not a weights and measures man, the bureau of weights and measures in Porto Rico is attached to the governmental department to which I belong, and I am, and always have been, very interested in the work which said bureau is doing for the benefit of all the people of the island, and more especially of the poorer classes.

The weights and measures service of Porto Rico is surely the youngest organization represented in this conference, as its work was not begun until the second half of the year 1913, after the legislature of Porto Rico, upon the strongest recommendations from the governor of the island, enacted a law to establish a standard system of weights and measures, to regulate the purchase and sale of commodities, and the ascertainment of weights and measures in industrial and commercial transactions and to prevent fraud therein. We were indeed very fortunate in securing the generous cooperation and help of the United States Bureau of Standards for the organization of the service in Porto Rico. A most able and competent man of said bureau, the associate physicist Mr. F. S. Holbrook, was detached to carry out the work, and he did it splendidly in a relatively short time, and in leaving the island he left behind him a very well organized weights and measures inspection service, under the direction of a Porto Rican officer, who had been thoroughly prepared by him for the performance of the important duties of the office of which he was to be in charge.

The work of our bureau has been very successful, due to the constant efforts of its chief, and the benefits accruing to the people on account of said work have been numerous and are greatly appreciated. I am not going to enter into the details of the work accomplished. If any member of this conference desires to obtain a more complete knowledge of such detailed work, I can forward him, upon request, the printed reports heretofore published by the Porto Rican bureau of weights and measures.

We have now established the service throughout the island. Every municipality thereof has at present its own inspector of weights and measures, who is designated by the mayor, with the approval of the secretary of Porto Rico. These municipal inspectors perform their duties under the control and supervision of the insular bureau of weights and measures, which is the central organization of the service. Furthermore, there are six insular traveling inspectors, who are charged with the duty of giving technical instruction to the municipal inspectors and otherwise enabling them to properly carry out their work.

During the last legislature we were most fortunate in securing the enactment of two laws which were very necessary in Porto Rico. Through one of them an amendment was made in the penal code, similar to one made some years ago in the penal code of the State of California, making it a crime to defraud a person of his labor. Heretofore some factories in Porto Rico had been indulging in the bad practice of defrauding the workingmen thereof in certain kind of labor which was to be paid at a fixed amount of money for the delivery of a fixed amount of pounds of certain articles. Our penal code had no provision for the punishment of this kind of fraud, and the weights and measures service was without legal means to put an end to such a corrupt practice and to protect the interests of the working people. Now a remedy is provided, and we are going to prosecute every fraud of this nature which may come to our knowledge.

There has been also in Porto Rico a growing clamor for the establishment of some inspection and testing of gas and electric meters, so as to protect the people in their transactions with the public-service corporations which own the franchises under which the public is furnished with these commodities. The secretary of Porto Rico introduced a bill in the legislature, providing for the necessary personnel in the bureau of weights and measures to extend its work so as to cover the inspection and testing of said gas and electric meters, and making an adequate appropriation therefor. As the public-service corporations in Porto Rico are under the jurisdiction and control of the executive council, which is the higher house of the legislature, the members thereof did not consider it proper to divide that jurisdiction by giving the inspection and testing of gas and electric meters to the department in which the bureau of weights and measures is located, so another bill was substituted for the original one, by which authority was given to the executive council to take and exercise jurisdiction over the inspection and testing of gas and electric meters, and to promulgate rules and regulations and establish standards of accuracy for meters used by the

public-service corporations and for appliances for testing and measuring such meters.

Gentlemen, it is a great privilege for me to have the opportunity of being present at this conference. I think I will be able to learn many useful things from the experience of the several members thereof for the enforcement of the weights and measures act in Porto Rico, and I will gladly receive your assistance and advice, and for this I thank you on behalf of the country which I represent.

UTAH.

By C. E. Condie, *Deputy State Superintendent of Weights and Measures.*

Mr. Chairman, this is the first time Utah has been represented here in any of the conventions, though we have received the reports and have been very much benefited by them. We have a pretty good law in Utah with regard to weights and measures. This law follows the model law as suggested by the Bureau of Standards. The great trouble is that the legislature made very small appropriations for the carrying on of the work in the weights and measures department and, therefore, we have been handicapped and have not been able to accomplish the good that we could do under our law if we had the necessary appropriation. At the present time we have but two State men working in that department. The cities have their city sealers and the State sealers cover the outlying districts. We have not as yet received a visit from the test car, but would like very much to have a visit from it. We have, however, received two visits from Mr. Holbrook, of the bureau, and we have been very much benefited by those visits. I think that is all I have to say.

The Chairman. In regard to the test car, it is not feasible to say exactly when it will be there, but certainly it will reach Utah sometime in the future. The States have to be arranged in series so that the car can go from one State to another. Now that we have two of those cars we can cover ground much more rapidly than heretofore, and I am sure if you will get in touch with Mr. Fischer he will arrange some date for the car.

VERMONT.

By George E. Carpenter, *State Commissioner of Weights and Measures.*

Mr. Chairman and gentlemen of the conference, the weights and measures proposition in the State of Vermont is, I believe, somewhat different from that which many of you have to cope with, inasmuch as we have no large cities and that practically all of our work has to be done in rural communities. This requires a considerable amount of travel to make the necessary inspections. However, we are gradually increasing the number of inspections, having shown an increase of nearly 2,000 in the last 12 months. We have at the present time, besides the commissioner, three inspectors who are on duty all the time. I consider all these men efficient inspectors and their work compares very favorably with that which has been done by the department in former years. It is true that we are somewhat handicapped by the fact that we do not own any automobiles in this

department, and I have not been able to convince the State auditor that such an expenditure would be a proper one on the part of the State. Those of you who have to deal with rural communities can readily appreciate the fact that an automobile for an inspector who has to go some distance between inspections would be an economical proposition, and I think the average cost of transportation would not be greater than at the present time. I have, however, one inspector who owns a car, and we are allowing him 10 cents a mile with a $5-a-day limit. I notice that he can turn in a larger day's work at a diminished cost.

The Vermont Legislature at its last session made no changes in the weights and measures law, but added two acts—No. 165 reading as follows:

AN ACT Relating to the legal weight of maple syrup.

SECTION 1. The legal weight of a gallon of maple syrup shall be not less than 11 pounds and the legal measure thereof shall be 231 cubic inches. Whenever maple syrup is sold by the gallon, quart, pint, or gill, or multiple or fraction thereof, it must be purchased or sold according to the above stated legal weight and measure. The legal quart shall be one-fourth of a gallon, the legal pint one-eighth of a gallon, and the legal gill one-thirty-second part of a gallon.

SEC. 2. Whoever sells or offers for sale a less quantity of maple syrup than represented or sells the same in a manner contrary to law shall be guilty of fraud and shall be fined not more than $5, or in case of a second offense not more than $10.

SEC. 3. Justices shall have concurrent jurisdiction with the county court of prosecutions under this act.

The other act, No. 166, reads as follows:

AN ACT To provide for the appointment of weighers or surveyors.

SECTION 1. The commissioner of weights and measures may designate one or more of the employees of a corporation, association, firm, or individual, or some other suitable person to act as a weigher or surveyor for such corporation, association, firm, or individual.

Such weigher or surveyor shall be appointed for a specified term and shall, before entering upon his duties, make oath faithfully to execute his trust as weigher or surveyor. The commissioner of weights and measures shall issue a certificate of such designation and shall keep a record of the same. The rights and duties of such weigher or surveyor shall be prescribed by the commissioner and such weigher or surveyor shall receive no compensation from the State for the duties so performed.

SEC. 2. If a person so designated misrepresents the quantity of commodities weighed or measured by him, or otherwise misconducts himself in the execution of his duties as weigher or surveyor, he may be removed from office and also be liable to a fine not exceeding $200.

Our endeavors to check up the weight of maple sirup have resulted in a very gratifying manner, in that we have weighed samples of maple sirup made by several hundreds of farmers and have only found one case where it did not conform to the present law. No. 166, relating to sworn weighers and surveyors, has not been tried out to any considerable extent, but I expect that next year will show more definitely the real value of this law.

I might say further that I personally envy the sealer of any State which has enacted a net-container law, and I trust that when the

Vermont Legislature meets in 1917 it will see fit to adopt some law along this line, as it is absolutely impossible for this department to regulate the contents of containers. I expect that a bill of this sort will meet with considerable opposition, as I am advised that my predecessor, Mr. Henry, has previously endeavored to have such a law passed without success. Trusting that public sentiment will be somewhat changed before another session, I intend to do my best to have such a law included in our statutes.

Thus far I have found the officials in the surrounding States to be of great assistance in cooperating with this department, and I very much appreciate their endeavors and shall be only too glad to reciprocate in any way possible. I also wish to express my gratitude to the National Bureau of Standards for courtesies shown me, especially last October, when I had a very delightful and instructive visit with both Dr. Stratton and Mr. Fischer. I appreciate their bulletins, as well as the bulletins of other States, and, being a new man in the work, I have found them extremely instructive. I regret that our appropriation is not sufficient to warrant the issuance of regular bulletins by this department in Vermont. However, this is a condition which may be altered in the near future, and I trust that it will be.

In closing, I wish to state that I have already derived a great deal of benefit from this convention, and I expect to be able to go back to Vermont and render to my State a better service because of the knowledge gained.

WEST VIRGINIA.

By C. W. Waggoner, *Assistant State Commissioner of Weights and Measures.*

At the end of the first year we have in our State some 32 county sealers. We have two men devoting all of their time to educational work for the State department. These State men are expected to help the county sealers. There are 55 counties in the State and we have covered 32 of them. We had an interesting school on the 19th of March for the county sealers which 23 men attended. It is a little too early to report the number of scales condemned, but I am sure we found a very large number. The activity on the part of the people in Ohio and Pennsylvania has made it necessary for us to clean up the stuff that they ship across the border.

I hope to tell you the next year how much faulty apparatus we gather up from Ohio and Pennsylvania.

The Chairman. The last gentleman has mentioned a thing that has often occurred to me, and that is that there should be some form of school for the officials. I have often wondered why instruction could not be given by some sort of a correspondence school. Certainly a great deal of good could be accomplished in each State by having a standard form of instruction. Some of you have it now in one form or another. It seems to me that great good would come from that if properly carried out. I have sometimes wished the bureau might be able to inaugurate something of that kind, some sort of a correspondence school, in connection with weights and measures.

WISCONSIN.

By Fred P. Downing, *Chief State Inspector of Weights and Measures.*

Mr. Chairman, I can not say, like a great many delegates who have preceded me, that this is my first visit to the bureau. I begin to feel as though I am one of the old landmarks. For five years I have been attending these meetings. Five years ago the Legislature of Wisconsin passed a weights and measures law which was a very good one, and we have been trying since the passage of that law to live up to the motto adopted in our weights and measures department, which is "Forward," and to improve the original law with amendments.

At the last meeting of this conference I called to the attention of the delegates the fact that our legislature was then in session, and we had proposed a number of important amendments to our law. Some of those amendments have passed and become law, and I can at this session tell you of our success in administering them.

One of the laws to which I refer was a law that placed the manufacturer of precision instruments under bond. We placed the manufacturer of the Babcock cream and milk-test bottle under bond to make his bottles accurate and to have him comply with our regulations. Prior to the passage of this bill the department had been testing some 70,000 of these bottles in our laboratory. That was an enormous undertaking. We decided that there was absolutely no reason why a manufacturer should not make such bottles accurate and we put them under a bond to do this. Thereafter, of course, it is no longer practicable to change their capacity. Their bottles are now in compliance with our specifications. We have had absolutely no trouble whatever in the enforcement of this act, and it has relieved us of an enormous amount of testing. In other words, it has led to efficiency. We occasionally test the accuracy of these Babcock bottles. Not only that, but I believe that we can extend this proviso in future legislation to other instruments made of glass—the prescription graduate, for instance. I do not know how many States inspect prescription graduates, but we are doing that in Wisconsin, and we found in our test that some 20 to 25 per cent of the graduates were inaccurate. They are very important measuring instruments, and they should be tested everywhere. The manufacturers of these should be placed under provisions similar to those regulating the manufacturer of Babcock glass bottles.

We also succeeded in getting the legislature to pass a bill which gave us jurisdiction over weighing and measuring appliances in stock in the hardware stores and other places of business, not in actual use but offered for sale. I believe that legislation on weights and measures should be of a remedial nature, that we should get at the source. After things have gone out into use, if they are inaccurate at the start, they may be used for six months or nine months or possibly a year before that inaccuracy is detected. If we can get at the source through a law of this kind, and we have been doing it in Wisconsin, it will be a great deal better. We have condemned thousands of measures of too light construction; we have condemned thousands of inaccurate scales before they were put into use. This

gives us a leverage, and it is leading to a great improvement in the honesty of weights and measures in our State.

There is just one more thing to which I want to call attention. As you probably know, the State department in Wisconsin is affiliated with the dairy and food commission. Last year I was in doubt whether any consolidation of the work of a dairy inspector and a weights and measures official would lead to efficient results. There is such a thing as making an inspector a jack-of-all-trades; we can carry that too far. Mr. Lincoln says in the State of Michigan the inspector tests everything from the B. t. u. heat value of gas down to the counting of toothpicks and matches. The man who can count toothpicks and matches may not be able to make the other test. We do not carry the consolidation so far as that in Wisconsin. We combine the sanitary inspection with the weights and measures inspection. The man who is in a grocery store or meat market testing the appliances, without any additional equipment, is required to have some knowledge of the statutes and some idea of what sanitation is. He can look into the ice box and see whether it is clean and see whether the utensils used by the butcher are sanitary. This leads to efficiency. We are doing this work out in our State. I believe that is all I have to say.

Mr. LINCOLN. The last speaker has given the idea that our men test everything. I had better explain that a little. Our drug inspectors perform the drug inspections and they go over the drug weights. They also have the inspection of the diamond weights and the gold weights. As the speaker says, there are those men in our department who have the food inspection and they also carry a weights and measures kit with them. We have not counted toothpicks and matches, but we have counted tacks.

I think the weights and measures department can be combined with the food department and the work goes along very nicely. I wish to indorse what Mr. Downing says about the bonding of the Babcock test-bottle manufacturers, because we, in our department, have tested out the Babcock bottles. All of the bottles in the State go through our department and we find we have assumed a lot of work, in fact, we have tested thousands of bottles. We will recommend to the next legislature the bonding of these manufacturers of milk-test bottles. If any of you test those bottles I would recommend that you have the manufacturers bonded because it otherwise means the testing of thousands and thousands of bottles.

In the matter of tacks, I want to say I found a lot of tacks running about 10 per cent short. The work of weights and measures is unlimited. You can go into any kind of field you wish, and you will find shortages and discrepancies there, and to my mind it is a greater protection to the manufacturers than it is to the consumer, because if a man has a shortage of any kind he generally lowers the price, so really the consumer is not out so much, but it is a greater protection to the honest manufacturer.

We have gone through our State on drug weights and measures and in going back through the State we find that it is necessary to condemn only a very small percentage on the second test, so that one inspection of apothecaries' weights will do for two or three years practically.

DISCUSSION AND INDORSEMENT OF A BILL TO SUBSTITUTE CENTIGRADE FOR FAHRENHEIT SCALE OF TEMPERATURE IN GOVERNMENT PUBLICATIONS.

The CHAIRMAN. It might be well for us to consider and take action on a bill which is now pending before Congress, namely, the substitution of the centigrade for the Fahrenheit thermometer scale in Government publications. This bill is being considered very seriously by Congress, and various associations all over the country are taking action in regard to it.

Mr. REICHMANN. Would you entertain a motion, Mr. Chairman, to take up that subject now?

The CHAIRMAN. Yes.

Mr. REICHMANN. Mr. Chairman, I move you that we consider and take action on that particular bill, and I will ask you to explain the object of the bill.

(The above motion was seconded and agreed to.)

The CHAIRMAN. The bill originated, so far as I am aware, with a Member of Congress, Hon. Albert Johnson, of Washington. Mr. Johnson has sent inquiries throughout the country and has received the opinions of a great many people. The American Association for the Advancement of Science sent out a circular letter and thousands of replies were received, and I think only a very small percentage of them were unfavorable. Other associations have taken action. It is true that most of the associations are scientific, but there seems to be very little opposition to the bill. Mr. Johnson is very desirous of having the widest expression of opinion, and that is why I suggested that this meeting take action. I did not intend to bring the matter up at this time but I merely wanted to call it to your attention, and I am willing to put the motion now, but if there are any here who think it ought to be further considered, or who would like to know more about it, we can defer voting on the subject.

I will be glad to have the head of our thermometer section meet with us and explain the bill in detail.

Mr. WAGGONER. Mr. Chairman, I believe that this matter has been discussed very freely in all of the papers, and I would like to make a motion that we vote on the subject now. Therefore, I move that it is the sense of this conference that we recommend the passage of this bill as has been outlined.

Mr. REICHMANN. I second the motion.

Mr. SWEENEY (of Pennsylvania). Before that motion is put, Mr. Chairman, I think it would be only right and proper that some knowledge of what we are going to vote on should be presented to the members of this conference. For myself I must confess I am not very well posted. I have no opposition to the motion, but I think in the interest of those who are assembled here we should receive some little knowledge relative to the bill, or the motion as it stands before the house.

Mr. REICHMANN. May I take the liberty of explaining very briefly what I think that bill means? All scientific and technical temperature work of the world is done under the centigrade scale. The technical laboratories, the Government departments, and all

others interested in temperature work are embarrassed by the fact that they have to express some things in Fahrenheit scale and some in the centigrade scale. This bill simply legalizes the centigrade scale and requires the Government technical work to be done under the centigrade scale so that the results will be understood by all the technical bodies of the world. That is the whole thing that the bill does, stated in a nutshell.

Mr. SWEENEY (of Pennsylvania). Does it prohibit the use of the Fahrenheit scale?

The CHAIRMAN. It does not, except in Government work.

Mr. REICHMANN. They can use it in governmental work, but the publications must give the centigrade value. The Government laboratories spend a large sum a year on account of the dual system which exists.

The CHAIRMAN. Some objection has been raised on the part of the Weather Bureau. They dislike the use of negative signs, and certain reports that they print will take a larger sheet of paper. They say that as the Fahrenheit degree is a smaller degree it is more suitable for their purposes, but the bill has been modified in order to give them a little more time, and suggestions have been made which are entirely satisfactory to the Weather Bureau. The Weather Bureau was apprehensive that their local observers all over the country would find difficulty in using this scale. Personally I do not think there will be the slightest difficulty.

There is another thing which we must keep in mind. We can no longer consider units and sections by themselves. We want the benefit of the work done in other countries and in other sections, and every step should be taken that can be done toward bringing all kinds of weights and measures work to a universal system. In other words, we need a universal language. Scientific work is becoming more and more closely related to practical work. It is perfectly absurd to print Fahrenheit degrees in the publications while using centigrade degrees in the laboratory.

The SECRETARY. Mr. Chairman, I have asked Dr. Waidner to come over and tell us about this bill.

The CHAIRMAN. I think it might be well to hear what Dr. Waidner has to say about this. Therefore I will ask Dr. Waidner to explain briefly the objects of the bill in connection with what we have heard in regard to it so far.

Mr. WAIDNER. Mr. Chairman and gentlemen of the conference, the bill under consideration was introduced by Representative Albert Johnson, of Washington, and relates to the use of the Fahrenheit scale in all Government publications. The bill specifies that during the next few years the Fahrenheit scale shall be placed in parenthesis after the centigrade scale, and that after January 1, 1920, the centigrade scale is to be used exclusively in Government publications. In order to give an opinion as to the advisability of this bill, the American Association for the Advancement of Science at its Columbus meeting appointed a committee to sound the sentiment of the various societies as to the desirability of this legislation. Up to this time 2,300 members of the association have replied, and 97 per cent are very strongly favorable. Of the remaining 3 per cent some were noncommittal and some opposed. This association, as you know, is composed of practically every scientific and technical society in the

country, and includes not only purely scientific men but physicians, surgeons, mechanical, electrical, and civil engineers, mining engineers, and nearly all fields of scientific and technical activity in this country. Recently this committee had sent out four or five hundred letters to doctors in the country.

Up to the present time practically every reply received from the doctors has been favorable to the legislation. They think it will simplify education decidedly to have but one scale. The big advantage which everybody recognizes is that of international uniformity. All publications in the world then will be using the one scale.

The bill has an important influence, because if we have one system it simplifies our teaching. It is extremely difficult for the young mind to keep two scales separate, and the centigrade scale is much simpler to teach.

As to the resolutions from various societies, they are now coming in. About 30 of the large societies have passed resolutions, all of them favorable and none of those received are unfavorable. I might mention the National Academy of Science, the American Chemical Society, the Electro-Chemical Society, the American Institute of Mining Engineers, and certain other technical societies like the Clay Tile Association, various State academies, faculties of a number of technical and agricultural schools, and certain medical societies, certain drug societies, the committee on the United States Pharmacopœia, representing the drug trade, and societies of that kind. They have passed resolutions favoring the bill. During the next month it will come before technical societies like the American Society of Civil Engineers and others.

The main objections which have been raised by those who do object is the difficulty of the ordinary man in learning a new idea. We admit that there is some trouble, but those who favor it, think it will be worth the trouble for two or three years until the people get used to the centigrade scale. Some people think it will require years to learn a new scale of temperature. The average man will soon learn that 20 degrees centigrade is a comfortable room and he will soon learn that 35 degrees is a hot summer day and 40 degrees is an unusually hot day. In a few hot days like that he will get more experience with regard to the centigrade temperature than you can imagine.

I doubt if there is very much force to the objections that our average American will have any difficulty in learning and applying in his every day life the centigrade scale to temperature.

I think that is about the status of the situation. I will be glad to answer any question that anyone desires to ask.

Mr. Farrell. May I ask Dr. Waidner a question?

The Chairman. Yes, indeed. Dr. Waidner knows more about this subject than anybody in the country.

Mr. Farrell. Will the doctor, in words that we can understand, describe the difference between the centigrade and the Fahrenheit scale?

Dr. Waidner. The difference between the Fahrenheit and centigrade scales consists mainly in the definition of their fixed points. On the Fahrenheit scale the melting point of ice is called 32°, and the boiling point of water under standard atmospheric pressure is

called 212°, the space between these two fixed points being divided into 180 degrees. The initial or zero point on this scale is a purely artificial one, being defined by a certain mixture of finely divided ice and pure salt. On the centigrade scale the melting point of ice, which is the lower fixed point, is called 0° and the boiling point of water is called 100°.

The ice point is a fixed point of great importance in the economy of nature and touches our daily life in many points, e. g., the safety of crops, the preservation of foods, problems in transportation, and in many other ways. On the other hand, the zero degree point on the Fahrenheit scale is a purely artificial point. This is shown by the fact that it is becoming quite customary in the Northwest and in Canada to refer to 20° Fahrenheit, for example, as 12° of frost, i. e., reckoning the temperature from the ice point rather than from the purely artificial zero point of the Fahrenheit scale.

Mr. Waldron. Is the Fahrenheit scale used in foreign countries?

Mr. Waidner. The centigrade scale is used in every other country in the world except Great Britain and the United States, and the centigrade scale is rapidly extending in use in Great Britain. In the testing of gas in London they have adopted the centigrade scale. Many engineering societies of Great Britain are writing their specifications in the centigrade scale. The local engineers have gone to the centigrade scale, so that it is in use in all countries of the world.

Mr. Downing. Mr. Chairman, it seems to me as though this bill is not an attempt to put over something that is theoretical for the benefit of the scientific societies, but it appears to me that this bill is highly practical. As has just been said, the constant point is the freezing point of water, and if we call that zero instead of 32 and call the boiling point of water 100 instead of 212 it will be far less confusing than the present system of enumeration under the Fahrenheit scale. It seems to be a practical form of instrument. We are all trying, in the sale of commodities, to get on the hundredweight basis. Why not get on the one-hundred basis in the matter of heat and have zero for the freezing point and 100 for the boiling point? To me this seems very practical and very feasible, and it would not be confusing to anyone.

The Chairman. There are no further remarks, and the question is called for. Those in favor of supporting this motion will say "aye"; opposed, "no." The motion is carried.

I am glad this association has gone on record, not entirely from the standpoint of the good it will do, but because it is the sort of thing you ought to have a voice in. It is a matter pertaining to weights and measures and I am glad, while I did not intend to interject it at this time, that you have taken some action in regard to it.

Mr. Reichmann. I move that the secretary be instructed to draw up a proper resolution as coming from the National Conference on Weights and Measures and give it to Congressman Albert Johnson.

(The above motion was seconded and agreed to.)

The Secretary. Mr. Chairman, I have a telegram here from Mr. I. M. Howell, the secretary of state of Washington, which reads as follows:

Kindly express my regrets at my inability to represent State of Washington and say I will be with them in spirit. Conditions in the State are better than

have been since passage of law, but experience teaches that model law would work better if responsibility was placed with the State in place of smaller units as counties and municipalities. Rinehart joins in best wishes.

The CHAIRMAN. There are very few of us who remember our first meeting, which consisted of Mr. Fischer, Dr. Reichmann, Mr. Palmer, and myself. We went over the essential details of these various meetings and I hope that as long as we have the weights and measures conferences we will have these gentlemen with us, whether officially or not, and that we will always hear something from them. I am going to take the liberty of calling upon Dr. Reichmann.

Mr. REICHMANN. Mr. Chairman and members of the conference, I feel a hesitancy in saying anything here because there are so many other weights and measures officials who have not had an opportunity to be heard, and who could give you a great deal more information than I. However, there is one point that occurred to me that has not been mentioned but which, I think, is very important, and that is to bring about a closer relation between the States and the bureau, and the weights and measures associations of the various States and this national conference. Two States that I know of which have weights and measures associations have appointed official delegates representing their associations, namely, the State of Massachusetts, represented, I think, by our good friend Sweeney, who is an official delegate of the Association of Weights and Measures of the State of Massachusetts; and, I think, Mr. Waldron is the first official delegate of the Weights and Measures Association of the State of New Jersey. They tried to put that across, because Mr. Waldron wanted to get two votes on everything, and I wish in your announcement you would try to anticipate that.

Joking aside, I think it is very important that the weights and measures associations of the States have a delegate come to these conferences, and in concluding I would like to make a motion that it is the wish of the conference that the secretary of the conference on weights and measures invite to the next conference an official delegate from each weights and measures association to be a member of the conference. I thank you.

(The above motion was duly seconded).

The CHAIRMAN. We ought to do everything we can to encourage the formation of these associations in the States. Those in favor of the motion say "aye;" (after a pause) contrary "no."

(The motion carried.)

The CHAIRMAN (continuing). We have with us Mr. Palmer, who is one of the pioneers in our line. We would like to hear from him.

Mr. PALMER. Mr. Chairman, I appreciate very much the compliment of being called upon, but I do not want to take up any of your time, because I know you have many discussions to come before the meeting.

I feel like Dr. Stratton, that it is gratifying to see so many delegates here from different sections of the country and also from the outside sections, such as the Philippine Islands and Porto Rico. It is simply carrying out the plans laid down in the earlier conferences and shows the interest which is being taken all over the country in the subject of weights and measures.

I thank you, gentlemen, and I hope the meetings will be beneficial to all of you.

The CHAIRMAN. I am sorry that time will not permit the calling upon a large number of city and county officials. They, in their way, have quite as important a message to bring to us as the others, and I hope during the meeting a time will be set aside to hear from them. We have one or two from California and other distant States.

I want to express my great appreciation of the talks that we have had this morning. Never before have we had such short, concise, and to the point statements from the State officials. It shows that the State officials are working, and they come here with definite problems that they are familiar with. It shows that they are becoming weights and measures officials in every sense of the word, and that is what we want. Never before have we had so many suggestions as we have had in these talks, and I want to thank you for them.

ANNOUNCEMENTS AND APPOINTMENT OF ENTERTAINMENT COMMITTEE.

THE CHAIRMAN. That concludes the regular program this morning. Luncheon will be served on the top floor of the West Building at 1 o'clock.

THE SECRETARY. Mr. Chairman, I have an announcement I would like to make. Your secretary has gone ahead and engaged a train to take us to Chesapeake Beach to-morrow afternoon. He has also obligated himself to produce 100 people at dinner. That is a great deal of a contract, it seems to me, so I want to get all the help I can in the matter. The fare to Chesapeake Beach and back is $1 and the dinner is to be $1.50, so that the whole trip will cost $2.50. I would like to have a committee appointed to arrange the details in connection with that trip because I have not time to attend to them myself. Perhaps we should have a ball game or something of that sort, and I would therefore suggest an entertainment committee to take care of the shad bake. I would suggest that we appoint on that committee Mr. Hansen, Mr. Willett, and Mr. Schoenthal.

THE CHAIRMAN. I will appoint the gentlemen mentioned as an entertainment committee.

(Thereupon, at 12.30 o'clock p. m., the conference took a recess until 2 o'clock p. m.)

SECOND SESSION (AFTERNOON OF TUESDAY, MAY 23, 1916).

The conference reassembled at 2.15 o'clock p. m.

PROPER PUBLICITY FOR A WEIGHTS AND MEASURES DEPARTMENT, BY CHARLES G. JOHNSON, STATE SUPERINTENDENT OF WEIGHTS AND MEASURES OF CALIFORNIA.

Mr. Chairman, delegates, and visitors, it is with a sense of gratitude and deep appreciation that I accept the privilege to address you on the subject of publicity, and I will thank you to bear with me, for I fully realize my limitations in doing justice to this very important subject. I can not, of course, deal with it from a professional or even theoretical standpoint for want of personal special application. I must, therefore, deal with it from experience, regarding it as a practical unit of service in the great constructive work wherein we are engaged.

Our work is a gigantic undertaking which, in order that it may to be a success from the standpoint of usefulness and direct benefit, calls for the cooperation of the people as a whole. It associates itself in some degree with the commercial, industrial, scientific, and economic phases of human endeavor, and in order that it may serve the true purposes for which it is intended, and may prove its usefulness and benefit, it must be given proper publicity.

Our work is a practical work and should be carried on along practical lines. It should be of vital interest to ourselves before we can make it practical for others. It calls for our serious application to scientific problems, a careful study of commercial and industrial conditions of extremely diversified natures, the exercise of cool and deliberate judgment based on law and good common sense. Our work demands a full measure of physical exertion, exemplary character, and model deportment. These qualifications attended with executive dignity may well form the basis of efficiency in this service. The maintenance of this efficiency is bound to express itself in the public's opinion, and in a design where these forces are sincerely manifested there is a power for progress which merits the concern and attention of the idealistic, the constructive, and the educational mind.

Publicity may well be termed a science. It is synonymous with education. The proper kind of publicity will generate favorable public opinion, and the utmost care and concern should always attend public utterances and expressions. It might be well to always apply the motto of Daniel Boone, "Be sure you are right, then go ahead."

Publicity along educational lines means progress, and no person who is thoroughly progressive in his work is satisfied to measure future possibilities by the record of what he has done in the past. The work of a weights and measures official calls for practical effi-

ciency, not theoretical efficiency. The public demands men who work and give service and earnest and constant application, and the filling of our respective positions with credit will result in the best kind of publicity. The secret lies in first doing good work and then talking about it.

To educate the public to a conscientious awakening to the necessity of weights and measures regulations is our first object. This should result in general cooperation. Every State and county official should be a special object for our educational efforts. The judiciary and our Federal representatives should be fully advised of facts concerning our work. This will result in a general governmental progress toward weights and measures enactments. The pulpit, the university, the college, and the grammar and the primary schools are open forums affording weights and measures officials a practical and constructive field of work, for in its general scope of usefulness there is generated a moral force which stands for truth, honesty, and manhood.

State and county fairs are educational institutions which offer excellent advantages for the practical exhibition of the result of the work of the weights and measures departments, and experience has established the fact that film concerns are willing agents to exploit the practical side of this very important work in which we are engaged.

The efforts of Mr. Hartigan, of New York, in bringing about an honest weight and measure week is publicity of a good and valuable character. It is the kind of publicity that will effectively generate a moral force for honesty in trade that will have permanent results for betterment. Incidentally the pamphlet prepared by myself under the name of "Making Honesty" has received an approximate circulation in excess of 5,000,000 and has been requested by more than 200 public libraries and public institutions of learning.

The public press is always ready and willing to publish any matter that is interesting and of importance. It therefore follows that in order that the weights and measures department may enjoy the confidence of the press representatives his work must be interesting and important. Failure in obtaining publicity may lie in the conduct of the department, rather than apparent disinterest on the part of the press.

First in importance in our work is the successful conduct of our departments as a public office, which work is dependent upon the efficiency of the administrative head. All of the colored and clever press agenting in the world will not serve to obscure for long actual maladministration of any office that reaches into and closely affects the life of the people. It is, however, not the importance of publicity to cover up mistakes and inefficiency of which I would speak, but the value to the people and to the State, and incidentally to the official, of publicity, which rounds out and supplements the sincere endeavor of earnest men to be really useful in the work to which they are appointed. If a public office is so conducted that it is fulfilling its functions, if its activities are important and helpful, the people should become familiar with its work. It is right that they should know what they are getting for their money. It is right that they should know what the office is endeavoring to do for them, because it is their law which is being administered. The people

should be given an opportunity to assist in the intelligent administration and enforcement of measures adopted for their welfare.

Publicity in public affairs is an expression of the new order of things. The word "government" to-day should be synonymous in the minds of the people with service. The administration of a public office must be aggressive and constructive if it is to accomplish really useful results. No one man in a department, or, in fact, any administrative group, can by himself effectively enforce any law. Public opinion must be behind it and for it. The people themselves must assist through publicity. They can be shown when and how their laws are beneficial and how they can help enforce their provisions. If they know these things and know that a resourceful official is ready and willing to serve their interests, that law is not likely to fail in accomplishing its purpose. An official who earnestly desires to serve the people can not go far wrong if he stays close to those whom he would serve. Publicity of public affairs, honest publicity that correctly mirrors the policies and activities of any phase of government, is the means that brings the administrator and the public together. If the policy is faulty, public opinion will check it before it has gone too far. If the activities of the department are plainly for the common good, the official will find support of invincible strength, because the people know what is being done for them. Representatives of the news service and press reporters in general are persons well worthy of courteous association and particular attention. Their confidence and cooperation is of mutual benefit, and it will not be found to be derogatory to efficiency and progress to encourage their daily visits to your departments.

We are engaged in a bigger work than is ordinarily conceded. We are engaged in a more important work than the public generally knows. Each official, from the superintendent to the sealer and deputy sealer, should be admitted to the responsibility, and perform a part in the educational work of the department, thereby dignifying himself and dignifying the department. Obtaining for his work the stamp of public approval should always be his serious concern.

The activities of weights and measures State conventions are a great educational force, and should be effectively published through the agency of an active publicity committee. Editorial discussions of weight and measure problems is not unusual, and due to their close relation to commercial and industrial welfare are always acceptable as good publicity matter.

From experience obtained as a weight and measure official I believe that I can safely promise for the future a constantly growing sense of responsibility. The more we apply ourselves, and the more we study the problems of weights and measures, the more we must realize that to enforce a law or regulation affecting trade and commerce, cooperation with the public is essential, and this cooperation depends on effective educational publicity. Efficiency in every department of our work means good and effective publicity. We are living in a wonderful age, an age of marvelous accomplishments. We must go forward, and to cope with new and complicated problems demands serious application, energy, and intelligence, and above all, good common sense.

Our immediate concern should attend every complaint. When criticism of our work is offered, the department should immediately

take the matter up with those criticizing; that is, when the criticism is in good faith, and argue the matter out. All of us have just one desire, and that is to do what is for the best interests of the people of our respective jurisdictions, and with that desire constantly before us, nothing but profit and good can come from meeting criticism and presenting our views.

The essential purpose of our work is to effectively protect the public and business itself against unfair methods of competition, with due respect for the right of all. The protection of the complainants, fairness to those complained against, and the interests of the people are best served by amiable adjustment founded on justness and fairness.

It ofttimes becomes our province to readjust trade customs. This phase of our work can best be accomplished through publicity. Publicity can be made the medium of great good. It can also be the medium of great evil. In patronizing the press for the purpose of preventing commercial misconduct, tact and carefulness should be exercised for fear of handicapping or discouraging honest and legitimate trade as the result of the prosecution of the illegitimate and dishonest.

The public press is a modern power of gigantic volume as an educational agency. As public officials it is our privilege to employ the public press, and by this employment, through the exercise of wisdom on the part of the weights and measures officials, the greatest benefits to legitimate trade and industry can be obtained, and to this service and for this purpose I desire to dedicate it.

Mr. HANSON. The members of the committee chosen in regard to the shad bake arranged for to-morrow afternoon have been around to get the sentiment of the people as to whether or not they care to attend. A majority opinion seems to be that they do not want to attend the shad bake at all. In order to put ourselves right before the conference, we would like to know what you desire to do about it; whether you want to attend the shad bake or otherwise. I therefore suggest that this matter be brought before the convention and let them decide this matter now.

Mr. WALDRON. I have been making some inquiries among some of the members, and they seem opposed to it. I signed that I could not attend to-morrow, but the reason was that I had an appointment with our Senator, but I am perfectly willing to pay my proportionate share of any loss the committee may have if this event does not go through.

Mr. FARRELL. I think that is the unanimous opinion of all of us here.

The CHAIRMAN. We were in some doubt as to what could be done. There seemed to be quite a sentiment in favor of it last year, and everyone seemed to have a good time. It was up to us to arrange something in the line of amusement or sport ahead of time, as it could not be done after you arrived. There was a great deal of sentiment expressed heretofore that you did not want anything in the way of a formal dinner. However, I think the matter should be entirely in your hands and you should do as you like about it. What is the status of the arrangements, Mr. Fischer?

The SECRETARY. Mr. Chairman, I think you have expressed the matter. I was told by everyone at the bureau that the shad bake last

year had been a great success; and if it was repeated, it would probably be as great a success this year as it was before. Therefore I made the arrangements I have referred to heretofore. However, I think it would be a mistake to go down to Chesapeake Beach for this purpose unless there is a lot of enthusiasm. I will call up the people with whom I have made arrangements and tell them to make the charge as light as they possibly can. The man who is preparing the dinner will have some loss, because there is no way he can sell the materials which he has already bought. As I said before, I am very much in favor of giving the whole thing up.

Mr. JOHNSON. Mr. Chairman, I suggest if the shad bake is done away with that our business be moved up one-half a day in order that some of our western delegates may have a half day to themselves for sight-seeing.

The CHAIRMAN. There will be no trouble in adjusting the program.

Mr. FARRELL. Why not move up Friday's afternoon program to to-morrow afternoon?

The CHAIRMAN. What is the objection to moving everything up? I would suggest moving the program up one-half a day. It is a good idea to get through, as something else may suggest itself.

Mr. SWEENEY (of Boston). I would like to suggest, Mr. Chairman, that it might be good policy for us to continue the program on Wednesday and get through with it. I have had experience at conventions of this nature, and if I have any criticism to pass upon the convention which was held here in Washington, it is that not enough time was devoted to the discussion of the real practical work of the small sealers who attend these meetings. I think the life and energy of this organization depends to a great extent upon a free and open discussion of conditions that arise among the different sealers. There are very interesting phases of the work which are not discussed here, and while I agree that some of the technical work and statements which are brought out are very good, still I think that the organization should not, in a measure, go over the heads of the large majority of those who are present here, but should get right down to the practical end of the work and permit free and open discussions. I respectfully ask if the program could be so arranged that we could at least on the last day have a discussion on the various phases of the work relative to the scales, pumps, and measures, and things of that kind? We are here together, a great many of us, and we can individually get a good deal of value and good work if we hear open discussions of these subjects. I offer that as a suggestion.

The CHAIRMAN. The suggestion is a very good one. Personally I would like to see time set apart for the discussion of such matters.

Mr. WALDRON. The most important thing to my mind is devising a method by which the committee, which arranged this affair, could be reimbursed.

The CHAIRMAN. There will not be any trouble about that. We will fix that matter up in some way.

Mr. REICHMANN. Following Mr. Sweeney's suggestion, I move you, sir, that Wednesday morning be devoted to discussion of subjects by the sealers; that on Wednesday afternoon there be discussion

by the manufacturers; that on Thursday morning be the program which is now filled for Wednesday morning.

(The above motion was seconded.)

Mr. JOHNSON. Perhaps Dr. Reichmann has lost sight of the fact that there are a great number of visitors here who regard your wonderful city as being the archives of things of interest, and we who are visiting Washingon have our time virtually scheduled by our respective boards of control, and we would like to avail ourselves of that afternoon to devote the time to personal indulgence in the way of inspecting and seeing many of the wonderful things to be seen here. Then, again, this program is all blocked out, and those who are prepared have made their preparations prior to their coming. Would it not be advisable to allow the program to stand as it is in order to give us time to devote that afternoon to personal enjoyment and gratification?

The CHAIRMAN. Gentlemen, we want you suited in this matter. Are there any further remarks? The motion of Dr. Reichmann is before us; that is, that we change the program in the way that he has announced.

Mr. REICHMANN. I would like to withdraw my motion, with the consent of my second, and I move you that we have a discussion of these subjects Mr. Sweeney mentioned after the reading of the papers this afternoon and after the reading of the papers on Wednesday morning. Unless there is objection we will understand that this afternoon and the following afternoon we will have time for these discussions.

The CHAIRMAN. As it stands, we have Wednesday afternoon free to do as we please.

Mr. JOHNSON. I move you, Mr. Chairman, that the committee in charge of the shad bake make a report to-morrow morning with regard to some good place to dine, where we can dine in a body at a fixed price per head.

(The motion was seconded and agreed to.)

The CHAIRMAN. The committee will take this up.

The SECRETARY. Mr. Chairman and gentlemen, I would like to make an announcement. We have arranged to have a moving-picture exhibit of the activities of the Department of Commerce. Some of these pictures are rather interesting. The pictures will be shown at the Raleigh Hotel about 8 o'clock Thursday evening.

The CHAIRMAN. I will say that these films are very interesting indeed, the ones representing the work of the Bureau of Fisheries are worth spending an entire half day to see. It might be well, if you arrange your dinner at the Raleigh, that these pictures be shown right in the dining room with the dinner. That was done once before when the secretaries of the chambers of commerce of the United States met here; the pictures were shown right after dinner and that might be a very nice arrangement here. Are there any further remarks or matters to be brought up before we start with the regular program?

Mr. HARTIGAN. May I revert back, with the permission of the conference, to the reading of the paper by Mr. Johnson, and call the attention of all weights and measures officials to the importance of the foreign newspapers. We find in the great city of New York a great foreign-born element and they have something like 25 differ-

ent journalistic enterprises which circulate among those people. It is probably true that throughout the country you have a foreign element which reads foreign newspapers, and it is likely the average weights and measures man gives more attention to the English-published newspapers than to the foreign-published newspapers, and it is important from our experience to circulate information through the medium of the foreign-language newspapers.

THE SELECTION AND MAINTENANCE OF APPARATUS IN INDUSTRIAL PLANTS, BY FRITZ REICHMANN, EX-STATE SUPERINTENDENT OF WEIGHTS AND MEASURES OF NEW YORK.

The ultimate object of every industrial plant is to secure profits on every one of its manufacturing operations. It is therefore necessary to keep the cost of production down to the lowest possible limit consistent with proper manufacture and to raise the selling price to the highest point that the market will stand. This bare statement of fact may be, and is, glossed over or veneered in many ways, generally for popular consumption. The selling prices are often fixed by competition or by agreement. Some may cite anti-trust laws as preventing this, yet it takes very little reasoning to see that such laws are economically unsound. They serve only to help a few lawyers and individuals and furnish a medium for official favoritism and possibly temporary notoriety, but in the end they result only in bringing about a most deplorable contempt for statute law.

In this paper I shall not attempt to discuss selling, but only a certain phase of the problems of production. The individual plant must be concerned with economical production. This means that among the many factors to be considered is the quantity factor, the careful, quick, reliable determination of quantity at various stages of production, from the reception of the raw material to the point of selling. This is a phase of weights and measures with which the public official is not concerned, at least not under any law now existing. Effectively he never will be concerned therewith. The simple reason is that official regulative inspection is and will remain, under our system of government, in the sphere of politics to a considerable extent. Governmental efficiency supervision of private industrial plants is ethically and economically wrong and is doomed to failure. It is attempted now and then for the sake of notoriety—witness the costly and ineffective so-called efficiency bureaus being experimented with by the City of New York, which interfere with business. Ultimate failure results because political activities should be for the general public and the ultimate consumer and should not be for and by the business man primarily. Make the results of the business meet the consumer's welfare and do not have the official officially fit the consumer to the dictates, carefully and insiduously given to be sure, of the business man.

Through the courtesy of Harvey Miller, of the Fairbanks Co., I have recently had an opportunity to examine in detail various kinds of weighing and measuring instruments used in industrial plants and to assist the manufacturer in solving some of the problems causing money losses due to improper weighing and checking. I would like to interject right here that this work which I am doing and which I

call scale, or weights and measures insurance, is absolutely divorced from sales and is independent of the type, make, or size of the apparatus. I am only concerned with its proper use and its continuing accuracy for the benefit of the manufacturer and the business man, that he may thereby furnish to the consumer a better and more nearly correct product. In this wise it is helping the weights and measures official and also the food official.

The average manufacturer and business man is so much concerned with other problems that he neglects the details of his scales and balances, his weights and measures. He wants them right, to be sure, but he knows nothing of them and assumes (oh, woeful assumption!) that a scale is a scale and a pound a pound and that they are always right. He generally leaves to an underling the purchasing of his scales, though they meter the dollars into his till or determine the uniformity of his product. To be sure, he sometimes employes efficiency experts or efficiency engineers (often a most expensive luxury), but they are mostly accountants and know about as much about scales and weighing as a barber knows about the construction or adjustment of a chronometer or other astronomical instrument.

The business concern must consider:

(1) Devices for checking the receipt of materials.

(2) Devices for checking the manufacture or interdepartmental records.

(3) Devices for putting up and selling.

In most instances these devices are scales, and the particular type, size, and accuracy required depends on the nature of the product and the process of its manufacture. Certainly, for an expensive commodity a more accurate device should be used than for an inexpensive one; for a heavy, concentrated commodity a different type than for a bulky one. A note of warning must be raised against many of the automatic and dial scales. They are not a "cure all," and their complication involves sources of error and loss absolutely prohibitive in some instances. Whatever device is used and wherever it is used it needs careful consideration and constant attention and supervision, not only as to the instrument itself but as to its use; for weighing instruments, it should not be forgotten, are very precise and responsive, far more so than almost any other machine.

In my very first report as superintendent of weights and measures of the State of New York, I emphasized that the majority of business men were honest but often careless. Where errors occur due to weighing, the business man generally is the loser, and, mind you, the loss is a percentage loss of gross receipts, not a percentage of the profits only. If, for instance, on a $100,000 volume of business, with a nominal profit of $10,000, the scales were 2 per cent inaccurate the loss would be $2,000 and not simply $200. In short, with correct scales the profits on this business would have been $12,000 instead of $10,000, or 20 per cent higher.

It may be stated as a positive fact that every concern that uses scales or any kind of measuring instrument, subject to wear, needs an expert supervision by a disinterested party with specific and particular technical knowledge. It must be evident that for very good psychological reasons an employee of the concern itself will not suffice. In order to illustrate and make myself clear, I shall cite a few instances.

Case 1. A factory making hardware specialties: In one department small bolts were put up and a count of the boxes revealed the fact that there was an average of 3.25 per cent overcount. As the production was 12,000,000 of these bolts a month, at a selling price of 22 cents per hundred, it can readily be seen that the concern was giving away over $800 a month on this item alone. In this case, though the scales were correct, the weighing was carelessly done by cheap labor. Even the manufacturer did not realize that a few extra bolts meant so large a loss. This is now corrected, and the weighing matters are regularly attended to.

Case 2. A wholesale drug house: This concern was of the highest reputation and was using scales of entirely too large a capacity and old weights with the openings filled with various accumulations. These were used for putting up 1-ounce packages of drugs. In the case of an order for 600 1-ounce bottles of ipecac, too large a bottle was used, and the amount put in each bottle was more than 30 per cent overweight. Ipecac was worth $1 an ounce. It was not hard to convince the officials of this company that it would be a paying investment to have all their weighing instruments under a periodic supervision. No wonder the business concern had never had a complaint. Almost anyone ought to be satisfied with 25 to 30 per cent overweight.

A similar case was that of a jewelry house, whose troy weights were heavy, and consequently gold was being given with each shipment or sale.

Case 3. A fertilizer plant: The bagging scales had recently been repaired by one of these so-called itinerant scale mechanics who infest some sections and know no more about a scale than a lawyer does. A test showed that there was an error of 1½ per cent on the scales, and in their use there was an overweight of an additional 1 per cent given, which meant a loss to the concern on its production of thousands of tons of an expensive fertilizer, of a very considerable sum. This is now remedied, and a regular inspection assures its nonrecurrence.

Case 4. Several coal yards: In the coal business the scale guages the returns directly in terms of dollars and cents. These need attention regularly. Many equipments are all but ruinous to the dealer on account of irregularities in weighing. A number of these show an error of 50 pounds per ton, and this coupled with "up weighing" cause considerable loss on the tonnage. A number of coal dealers in New York City and vicinity now have their scales gone over carefully and systematically every month by a scale mechanic to protect themselves and their customers. There still persists the unfortunate and vicious system of "official public scales," probably without any legal foundation. (The losses due to lack of proper supervision and weighing in coal yards was discussed at length in the Coal Trade Journal (New York) of Mar. 1, 1916.)

Case 5. A large coal dealer: One of the largest coal dealers has no periodic test or adjustment. The weighmaster of the individual yards is instructed by the owner to put a 50-pound weight on the scale every morning. This is about as effective as spitting on the platform would be. I made an investigation on some dozen or more

of the weighings, and if all were like these, then the officers of this particular company were losing for the company about $20,000 per year. This is simply lack of appreciation of the very essentials of their business and is causing considerable loss.

Case 6. A factory making underwear: In this case the weights were worn and the jack spinners were receiving too little pay for their work. They are paid by the weight of the yarn they spin; the finer the yarn the more the payment per unit. As the weights were light the apparent unit weight was more and the spinner's pay was less. This was a case of a loss of thousands of dollars for the employees and the loss of thousands on the part of the employers on account of the dissatisfaction created. This condition has been remedied.

Case 7. A chemical plant: The work done was of such a nature as to be very hard on the weighing devices and there was a continual scourge of error and disagreement. The firm had installed expensive dial scales and were thereby really throwing money away in the first instance and getting poor results. What they needed to do and did do, was to buy less expensive but more accurate beam scales and then replace them frequently as they became corroded.

Case 8. A specialty manufacturing concern: This firm makes celluloid specialties. They use scales to check interdepartment operations. The commodities handled are worth over a dollar a pound. The scales were found to be out of agreement by as much as 7 pounds. It can be readily seen that the records of the department needed considerable doctoring before they could be made to agree. The system of records created expense and chaos where it should have occasioned savings and order. This has been nicely straightened out.

Case 9. A metal manufacturer: A plant in New Jersey making an expensive and much advertised alloy metal had a small scale on which rods were sold at 80 cents per pound. The scale was barely sensitive to 2 pounds. A large dormant scale for weighing large castings was insensitive to 50 pounds. The castings sold for 40 cents per pound. This concern, after having their attention called to the case and being shown that there were considerable losses to them had some temporary repairs made, I believe. They will go along now losing money for the stockholders until the scales become too bad, and then again temporary repairs. The equipment needs decided changes, but at present they are too prosperous to realize their "slipshod" methods.

Case 10. A paint and color factory: Here there was a considerable loss due to gummed pivots and bearings as well as to woefully improper scales. The products are valuable and the management intelligent and they want the scales in their factory gone over regularly.

Case 11. A special chemical product plant: In this plant commodities worth $40 a pound were weighed on scales that were correct to the smallest graduation, but the finest graduation was only a pound. There was a possible error of $40 on each weighing.

I could go on enumerating all sorts of business concerns—feed dealers, cheese dealers, grocers, hair dealers, manufacturers of all sorts of metal goods and chemicals, drugs, varnishes, and paints.

The above few cases illustrate the point that I want to emphasize. Every concern in its business needs some sort of weighing or measuring device, and above all needs to know that it is correct and correctly used; needs disinterested technical advice as to the proper kind to use and advice based and backed by practical knowledge. I also wish to emphasize that such work of proper supervision does help the consumer or purchaser, and that is the one that the official is concerned with and the only one he should be concerned with. If he is not, he is a poor public official and will not accomplish much. I am speaking now of the officials carrying out regulative laws, not scientific or technical bureaus, which serve an entirely different function. There are no such bureaus in any of the States as far as weights and measures are concerned.

Also to the business man I would say that the weights and measures official is doing a lot of good in apprehending the crook; doing good not only for the ultimate purchaser, but also for the honest business man. But the public official can not protect the business man in the matter of weights and measures in the organization of his business nor in the conduct thereof. The business man must do that himself, and if he does not do it properly or wisely he loses, and loses more by the giving of overweight than in any one thing.

I would like to take this opportunity to mention briefly another shortsighted business policy, and that is the matter of the mining of coal. Coal should be mined by weight. It is in some sections, but not in all by any means. The miners' pay must be based on some unit, and if they and the operators would agree in the first instance that all coal should be mined by the ton or the hundredweight, they would make a long stride toward a permanent agreement by eliminating the uncertain element that both sides disregard. They claim they do not, but they do. There is no place in this country now where any reliable information can be obtained relative to the condition or the continuing accuracy of the miners' scales. What little information I have, indicates that they must be very, very bad. This will be a fruitful source of investigation. I say, correct the miners' scales, keep them continuously accurate, and mine and operate only by weight; then 50 per cent of the ever-recurring troubles of the operators and the miners will cease. The public are vitally interested in this, for their pocketbook is the one that must pay. The Secretary of Labor could do something in this matter which would be of prime importance.

In conclusion I wish to summarize by stating that the State or city or county weights and measures official can not test the scales and weights and other metering devices of a business concern often enough for the business man's protection. He can only hope to do something in apprehending the thief who mulcts the consumer. Every business man who has any use at all for scales or other metering devices can certainly save, and thus make a very considerable amount of money by having these devices periodically tested and adjusted by experts in that line, and stopping the leaks as soon as possible, for it is the daily and the hourly visible and invisible leaks that cause the greatest losses.

DISCUSSION.

The CHAIRMAN. Dr. Reichmann has touched upon a very important subject, and one with which you will be brought in contact sooner or later. Only two or three weeks ago I was on a visit to the South, in one or two cities, with Secretary Redfield. We were going through a large cottonseed oil manufacturer's plant where they were putting the cottonseed oil up in small cans. I saw there not only that the weights and measures used and the balances and weighing devices were all covered with oil, on which the dust had collected, and they were in a most inaccurate condition, but I actually saw a device in use which some one of the boys had devised. This was a common grocery scale, upon one side of which was the can to be filled, and, as it was filled, the fall of the beam turned the faucet and cut off the flow of oil. I asked him how he compensated for the work done, and he said not very much, that the oil did the work. That was in one of the largest factories in the city, and it was the crudest device I ever saw around any concern.

Mr. JOHNSON. While on that subject, Mr. Chairman, I want to recall a peculiar case we prosecuted in the State of California in the last 30 days. A firm was putting up a certain kind of oil for use in automobiles, into gallon, half-gallon, and quart cans. In forcing the oil under heavy air pressure to get the flow, air globules were formed, which transferred themselves into the can, and, although the can was apparently full to the very top, yet in about half an hour it would settle, and we found on investigation and inspection that an average gallon can was anywhere from 6 to 8 ounces short and the average 5-gallon can was as much as 2 quarts short. We obtained a successful prosecution of this firm at Los Angeles. We had four other cases which we held in abeyance during time granted for corrections to be made. In Los Angeles there was a difference of 140 gallons.

Another point which Dr. Reichmann mentioned, which is of vast importance to weights and measures officials, is the adoption of specifications of weights of the various materials to be employed in the construction of weighing and measuring apparatus. As a result of flimsy construction in certain types of pitless dormant scales, we were virtually forced to refuse the installation of two standard makes, for the reason that the material used would not support the capacity intended for the weighing machines. That is a very important point, and I trust the committee on tolerances and specifications will take it under consideration.

The CHAIRMAN. There is not a sealer here who will not come in personal contact with many cases of that kind, and I have always thought it our duty to help the man who wants to do right, just as it is our duty to prosecute the dishonest man. I am more and more surprised at the carelessness with which some of the larger concerns do business. We get a great many inquiries along that line. Some firms, of course, are very progressive and employ good men, but, as a rule, the smaller manufacturers are careless, and you will find that there is quite as much opportunity to do good along the line of educating these people and telling them what to do as in seeing that they do not do the thing they ought not to do.

Mr. REICHMANN. Mr. Chairman, I think it is a great deal more effective to tell them where they are going to lose money if they do not do certain things.

LIQUID-MEASURING PUMPS, BY F. J. SCHLINK, BUREAU OF STANDARDS.

(NOTE.—The above-entitled paper, which was read at the conference, has been published as a technologic paper of the Bureau of Standards, and will be found at the end of this volume.)

DISCUSSION.

Mr. RIORDAN. I would like to ask a question, Mr. Chairman. If a drop of 10 degrees in temperature causes a decrease of one-half of 1 per cent, would a rise of 10 degrees in temperature cause a corresponding increase?

Mr. SCHLINK. There is not an increase in all cases. Understand, there is an error in the first delivery only, after the pump has been standing unused. For example, if a pump has stood overnight and the temperature has fallen 10°, the volume of liquid in the pipe will have reduced one-half of 1 per cent. The first delivery will be short on that account. If the volume of liquid has expanded, the excess will be forced back into the tank through foot valves or through the discharge openings. After the first delivery has been completed the pump will measure as usual, the error not being due to faulty quantity of the liquid, except as to the volume due.

Mr. RIORDAN. For instance, if an oil company makes a shipment of gasoline to a subagent, does the quantity depend, to a certain extent, upon the temperature when received?

Mr. SCHLINK. Exactly so.

Mr. SCHOENTHAL. With regard to sealing stops of gasoline pumps, I took the matter up with one of the agents with a view of having the company drill holes as indicated in Mr. Schlink's illustration, and they claimed that that would weaken the rod and it was not an effective way of sealing. The better way is by sealing with a cap, which was also shown on the illustration, and the claim was made that this stop or seal, as they called it, had been used effectively throughout the United States. I must confess that we have not found it to be very effective, and I would like to find out if there is a way of determining how extensively these stops have been used throughout the United States, and how they are regarded.

Mr. SCHLINK. I think I might inform you that on certain sizes of one make of pump of this type, such a stop is in almost universal use. Whether or not the stop can be effectively sealed by merely preventing a set screw from being turned is an open question at the present time. However, it becomes largely a question of specification whether or not we shall permit a stop to be retained by friction or pressure under the set screw upon a smooth rod. If no other type of stop could be provided, I should think the sealer could provide that the rod and lug be drilled. I know of no other way in which to insure one's self that that lug can not slip during the normal operation of the pump.

The CHAIRMAN. What is the usual diameter of the rod?

Mr. SCHLINK. Three-eighths of an inch in diameter. I do not think the drilling of the hole is of any serious moment whatever.

Mr. SCHOENTHAL. I am more particularly interested in the seal at places where it has been tried. I have known of a number of instances where shields were put on so loosely that the set screw could be moved, and I am wondering whether they have had more success throughout the country.

The CHAIRMAN. If the specifications exclude that kind, they will at once supply a rod large enough. However, a rod three-eighths of an inch in diameter would support several thousand pounds and it will not have any amount of pressure against it.

Mr. HARTIGAN. In the city of New York we are much interested in the matter of meters, or indicators, for the gasoline-buying public. Our present regulations cover rather completely the technical and scientific end of the subject, but to-day, owing to the fact that in New York there are over 200,000 pleasure and commercial vehicles and something like 6,000 or 7,000 garages, the necessity arises of having something by which the public may know how much is flowing into their tanks. We all realize that the automobile public in the past have been more or less careless of both quality and quantity of gasoline; but to-day there is an awakening going on in automobile circles and they are beginning to become interested.

From the paper read by Mr. Johnson, of California, there is no better means of advertising weights and measures work than by the promulgation of regulations as to what kind of meter or guide should be used in connection with an automatic pump for delivering gasoline. In New York we are preparing a regulation, and we want to be fair to all the manufacturers of gasoline pumps, and we want our phraseology to be such as not to favor any manufacturer, and in so doing we are calling upon the Bureau of Standards to assist us in the preparation of that regulation for use in New York City, which might in time circulate throughout the entire country.

The CHAIRMAN. The bureau will be very glad to cooperate with you.

Mr. BARNARD. I would like to ask Mr. Schlink if, in his experiments, he has found his test of one day would be the same perhaps on the next day. In experiments I have made I find I may test a machine one day and regulate and adjust it until it delivers correctly and then go back, possibly two days afterwards, and find the same machine to be in error, and still the seals had not been disturbed in any way.

Mr. SCHLINK. That condition can be easily explained by the fact that in many cases measuring pumps are readjusted after installation to correct up the defective installation. Each measuring pump is tested at the factory, and there adjustment is made with probably as great care as it can be made by the sealer. However, in many cases I find after a pump is installed, either due to excessive lifts or leaks in the suction line, the pump is not discharging gasoline, but a mixture of gasoline and vapor, and the owner proceeds to readjust the stops so that he will have made an approximate correction for that amount of admixture. That method is correct, obviously, only in case the error is a constant one. A difference of a few degrees in the temperature of the gasoline will seriously affect the amount of vapor which will occur. I think that will explain, in most instances, why a difference exists from day to day. It is primarily the installation that is at fault.

Mr. BARNARD. I might add that I called to my city one of the experts for one of the manufacturers and we took down two or three pumps in which I found a difference to exist, and we found in each instance it was a case of faulty installation.

Mr. FARR. Do you believe that the mechanical construction of gasoline pumps will have to be changed if the gasoline is found of different specific gravity?

Mr. SCHLINK. It is my opinion the differences now existing in the handling of highly volatile gasoline can be entirely overcome by installing the pumps at such level that they will not lift excessive distances from the tank to the base of the cylinders. That means underground-pump installation with overground-pump head. Then with the vaporization troubles removed, I think any differences due to variation in the liquid should be negligible, provided only the mechanical construction and workmanship are good, and the fitting of all parts is careful, and the valves accurately retain the quantity in the pumps.

Mr. FARR. Our oil in the California district varies from 80 per cent specific gravity to 52 per cent, and the gasoline with which one pump was tested was 52 per cent gasoline that had been used time and again. The pump was then sent out to an oil station in the field where the specific gravity was 80 per cent. The pump was returned to the maker and returned to me as a pump passed by myself. I took my equipment and my assistant and went out to the place for further inspection. The pump was accurately installed and the mechanism perfect. We spent a day and a half and it developed that the mechanical construction of the pump was such that it would not pass the same amount of 80 per cent gasoline as 52 per cent gasoline. So I think possibly that will be of some interest to you in testing a high quality gasoline.

The CHAIRMAN. Gentlemen, would it be wise for the association to go on record, or to appoint a committee, looking forward to general specifications of these measuring devices? It seems to me that when we have had enough experience—I do not know whether that time has arrived or not—that it would be proper for us to make general specifications; that is, the conditions under which they should be turned out and installed.

Mr. BARNARD. It seems to me we are all having trouble enough with the gasoline-pump situation and the quicker we get down to facts the better it will be for us all.

The CHAIRMAN. It is just as important a subject in many ways as is the subject of weighing scales. I have always felt that it was rather a delicate situation. Personally, I like to see the liquid come up into a capacity measure and the capacity measure emptied, and I do not know why they should not be constructed in that way.

RESOLUTION FOR OBSERVANCE OF WEIGHTS AND MEASURES WEEK.

Mr. HARTIGAN. Mr. Chairman, I desire to offer a resolution.

Resolved, That the National Conference on the Weights and Measures of the United States approves of a national weight and measure week and recommends to all weights and measure officials in the United States its promotion in their respective communities. Weight and measure week is scheduled for the year 1916, beginning with Sunday, June 18, and ending Saturday, June 24. It is further recommended that weight and measure officials who intend to promote weight and measure week obtain the support of supervisors, the mayors, and governors of their respective communities, as well as the cooperation of consumers, organizations, women's clubs and societies, trade, commerce, and industrial associations.

It is further recommended that weight and measure week shall not be celebrated as a fête or a ceremony, but shall be used for the general purpose of stimulating interest in and support of weights and measures laws and subjects with the ultimate view of educating both the buying and selling public.

I move the adoption of the resolution.

(The above motion was seconded.)

The CHAIRMAN. You have heard the resolution and the second. Are there any remarks?

Mr. JOHNSON. I would like to ask Mr. Hartigan if he had any difficulty in obtaining from the council the necessary appropriation of money for the exploitation of matter of this kind? I would like to have you include in your reply the channels through which you were successful.

Mr. HARTIGAN. Mr. Chairman, in that respect we decided we would not ask from the city of New York one dollar for use for weights and measures week. I personally appointed 1,000 citizens of the city of New York, men and women, those in business and those out, and out of that 1,000 I got an executive committee of 100, and the question came up for discussion one day as to how to defray the expenses. I told those people that I would not ask the city of New York for one dollar, because this was purely an experiment, and I did not believe in experimenting with the people's money. Our expenses amounted to about $415. We had subscribed by these 100 committeemen something like $515, and the surplus I turned over to the police department and fire department pension fund. If you can depend upon the citizenship to support you with money, I believe that I prefer that method.

Mr. REICHMANN. Mr. Chairman, before seconding that motion I would like to say a word or two for the weights and measures week in New York that Mr. Hartigan may be too modest to say. There is no question in the world but what the weights and measures week in the city of New York created a great deal of talk about weights and measures and created a great appreciation among the people on the subject of weights and measures. One evidence of that was the fact that I think there must have been 500,000 posters in windows announcing weights and measures week. I personally know of at least 20 stores where they had little exhibits labeled, "What we have done for weights and measures," and citing instances in their stores which were found to create attention in the mind of the public purchasing there, and were bound to attract the attention of other merchants.

Commissioner Hartigan is a very astute politician and a very astute psychologist, who can work on the mind of the people. I have two little tots in the public schools, and they were wearing those little buttons, "I believe in 16 ounces to a pound," and they were talking weights and measures for three weeks afterwards. That weights and measures week taught those little tots more about weights and measures than they would learn in any other way in 10 years. I think that weights and measures week is a good thing for a national move.

The CHAIRMAN. It seems to me it is one of the best things that has been proposed in the way of publicity. It can not possibly do any harm where it is not taken up, and in localities where taken up seriously it can accomplish a great deal of good. It emphasizes the educational side to my mind, and we have just begun to touch upon the educational side.

I was thinking what a good opportunity that would be sometime to teach the public the metric system. I know there are a great many people in New York who know about it already, but there are others who do not. There are going to be a great many things come up from time to time and we want to reach the public, and this is a very good way in which to do it. If there are no other remarks, those in favor of the resolution say "Aye," contrary, "No." The motion is carried unanimously.

Mr. SWEENEY (of Boston). Would it be possible to have this resolution printed so that we can have it?

The CHAIRMAN. Yes; we can have that duplicated.

Mr. BARNARD. I would like to ask if it will be possible for us to have a copy of Secretary Redfield's remarks before we leave.

The CHAIRMAN. Yes. I think we can get that to you. I thought, as Mr. Schlink was talking, that it would be a good thing for us to have his remarks printed as soon as possible and distributed. That is the sort of paper which loses a great deal of its importance when given as it was. I will say that that will be printed as soon as possible.

Mr. JOHNSON. It appears to me that the annual report of the conference is virtually the result of our work, and I know that I have perused the last issue prior to the one we received to-day, and have gotten a great deal of good out of it. If I could bring back with me a copy, or notes of the great amount of work that has been done here, I am satisfied it virtually advances the standard of our work that much more. Had I known that the report was not going to be printed until a year from now, I would have provided myself with notes of the matters presented here in order that I might employ them at as early a date as possible. I wish we could have these reports, and if it is agreeable, I will take the pleasure of introducing a resolution to that effect at a later time.

The CHAIRMAN. A resolution as to getting them out early?

Mr. JOHNSON. Yes.

The CHAIRMAN. That will not do any good. It is largely a matter of clerical work, as I understand.

The SECRETARY. There are a number of reasons why the reports have been delayed. In the first place, it is difficult to get anything done in a hurry by the Government Printing Office. Also in this particular case, delegates kept promising some of the papers, and I do not think some of them have arrived yet. I think the last report was in the Government Printing Office for four months. They are very busy, and we can not get anything done quickly during the time that Congress is in session without paying the 20 per cent increase, and, with our appropriations, we do not feel like spending that much more. I would not like to promise the report in less than three or four months.

The CHAIRMAN. There will not be any funds before July 1, but it will take all of that time to get it ready. If the papers are all sent in promptly we will make every effort to get it out as soon as possible.

Mr. REICHMANN. Mr. Chairman, I move that we now adjourn.

(The above motion was seconded and agreed to.)

(Thereupon, at 5 o'clock p. m., the meeting adjourned to meet at 10 o'clock a. m., Wednesday, May 24, 1916.)

THIRD SESSION (MORNING OF WEDNESDAY, MAY 24, 1916).

The conference reassembled at 10 o'clock a. m., at the Raleigh Hotel, William L. Waldron, of New Jersey, presiding as chairman.

The ACTING CHAIRMAN. Gentlemen, the meeting this morning will be devoted to the members of the National Scale Men's Association.

INSPECTION AND TESTING OF TRACK SCALES, BY B. B. GORDON, SCALE INSPECTOR, PENNSYLVANIA LINES WEST.

Mr. Chairman and members of the National Conference on Weights and Measures, it has been said that the three great events in a man's life are his birth, his wedding, and his death, but I may add that to a man like myself it is a very important event to read his first paper before an audience of this kind. Public speaking has never been one of my accomplishments, as I was not born with a silver tongue nor with any Shakespearean tendencies. In fact, my maiden effort was made on March 15 of this year, when I read a paper before the Indiana State Conference on Weights and Measures. Nevertheless, when I was invited to read another paper before this conference I did not hesitate very long in accepting the invitation, sending my acceptance by return mail lest the president might have time to reconsider.

It certainly is an honor for me to be permitted in any capacity to address the Weights and Measures Conference of highest authority in this country, and I consider it a double honor to come before you as one of the appointed representatives of the National Association of Scale Men, the largest body of scale engineers in the United States.

As to the subject of this paper, I take it that it is one with which the majority of you are familiar only in an elementary way, since most of you are neither railroad-scale inspectors nor engaged in the manufacture of track scales. Therefore it is not my purpose to make this discussion highly technical—perhaps I could not do so if I would. On account of the constant change in the personnel of these conferences there are always a goodly number of beginners, and it is to them in particular that this paper is addressed. I remember that when my attention was first directed to scale construction, installation, and testing, about 18 years ago, there was very little if any printed information pertaining to the subject. Information at that time was to be obtained only from older scale inspectors, who were few in number and who had acquired knowledge from many years' experience in scale construction, but unfortunately the pioneers of scale manufacture and installation were not at that time disposed to give out any information whatever to beginners. I remember very well that if anyone approached one of those pioneer scale inspectors while he was adjusting a track scale he would immediately cease work until the party who so boldly displayed his curiosity had passed on.

In consequence of such secrecy a beginner had very little opportunity to acquire any information unless he was a man of strong initiative. Even at this date there is not very much reliable printed information pertaining to scale design except what is contained in a few manuscripts which have been read before different organizations interested in scales and weights. I know of only one publication on the scientific construction of scales, and that is highly technical and in the German language, "Konstruction der Wage." Before the English translation appeared I sent to Germany and secured a copy of this book. Lacking knowledge of German, it was necessary to study the language before I could translate it. After seven months of effort I was beginning to make pretty fair headway, when I was fortunate enough to secure a pencil translation made by Dr. Miller, of Pennsylvania. From that I made five typewritten copies and reproduced by hand all the drawings, of which there are a large number. At that time I had, I believe, the only copies aside from the pencil manuscript in America, as the English translation was not published until some time afterwards. I am mentioning this just to show how hard it has been to acquire any reliable information on so important a subject as weighing machines.

In these later years, however, conditions are very different from those I have just described. The training which a scale inspector on the Pennsylvania Railroad receives to-day is very thorough, because of the fact that our company does its own designing, manufacturing, installing, and testing of track and motor-truck scales. This gives the inspectors a much wider and more extended experience than falls to the lot of most scale men, and it is invaluable.

Before proceeding with the subject of testing scales, I wish to divide all track scales into two classes—(1) the straight-line scale, and (2) the torsion or pipe-lever scale. Scales of either class may, however, be any one of three types—the rigid-bearing, the suspension-bearing, or the plate-fulcrum type, the last being the very latest design. Scales having rigid bearings usually have a live or floating deck, as shown in figure 1. As a rule they have a wooden substructure. While they are very good scales, the wear and tear makes the cost of maintenance high.

Figure 2 shows a scale with suspension bearings. This type usually has a rigid deck, and there is nothing of the scale exposed to the weather except the rails. This is an advantage, as dirt or snow falling on the deck does not affect the scale materially. The suspension bearing has a distinct advantage in that the wear on the knife edges of the main levers is reduced to a minimum, thereby making the accuracy of the scale more constant. This scale has another advantage in that by reason of its design the scale vault can be wider and longer, thereby affording better opportunities for inspecting the various parts. This scale, as a rule, is placed directly on the concrete instead of on timber, as is the rigid-bearing scale. It is the practice of the Pennsylvania Railroad to place all scales of this type on large metal bedplates, in order that the area of pressure on the concrete may be larger. Of course this is desirable only where heavy traffic passes over the scale.

The latest change in track-scale design is shattering traditional beliefs and practices. For centuries it was thought that knife edges,

links, and loops were essential to a scale, but figure 3 shows a scale which has none of these. The Pennsylvania Railroad has had one of these plate-fulcrum scales of four sections in service at East Tyrone since August, 1915, and it weighs several hundred cars a day with great accuracy. This is the first track scale of this kind to be placed in service any place, and it is remarkable for its simplicity. It was my privilege about three weeks ago to see another plate-fulcrum scale of only two sections, of 800,000 pounds capacity

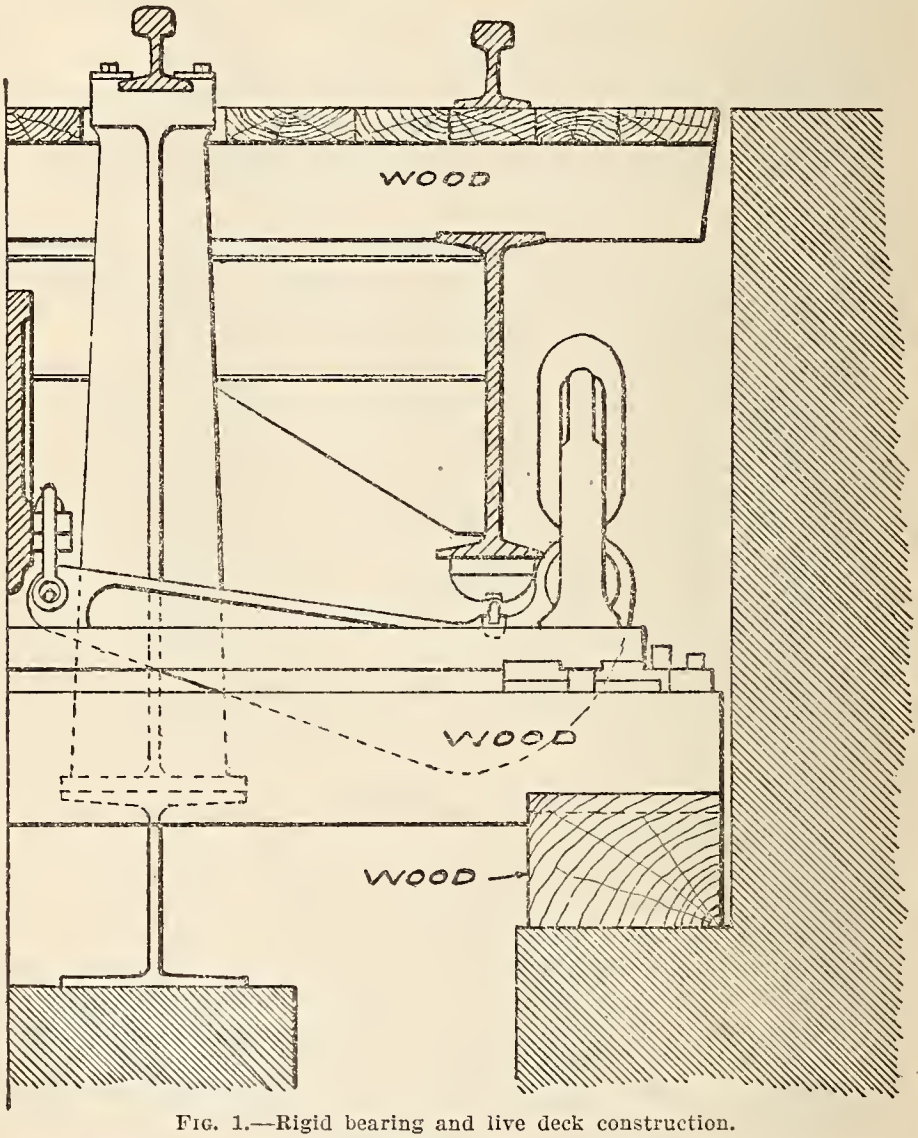

FIG. 1.—Rigid bearing and live deck construction.

and 52 feet long, which will also be installed on the Pennsylvania Line. This is the first scale constructed with only two sections, to say nothing of plate fulcrums. Its future is promising, and its advent marks an epoch in scale manufacture.

The following equipment is necessary for testing any one or all of the above-described scales:

The first essential is a number of primary or master weights, varying from 50 pounds down to grain weights. These should be

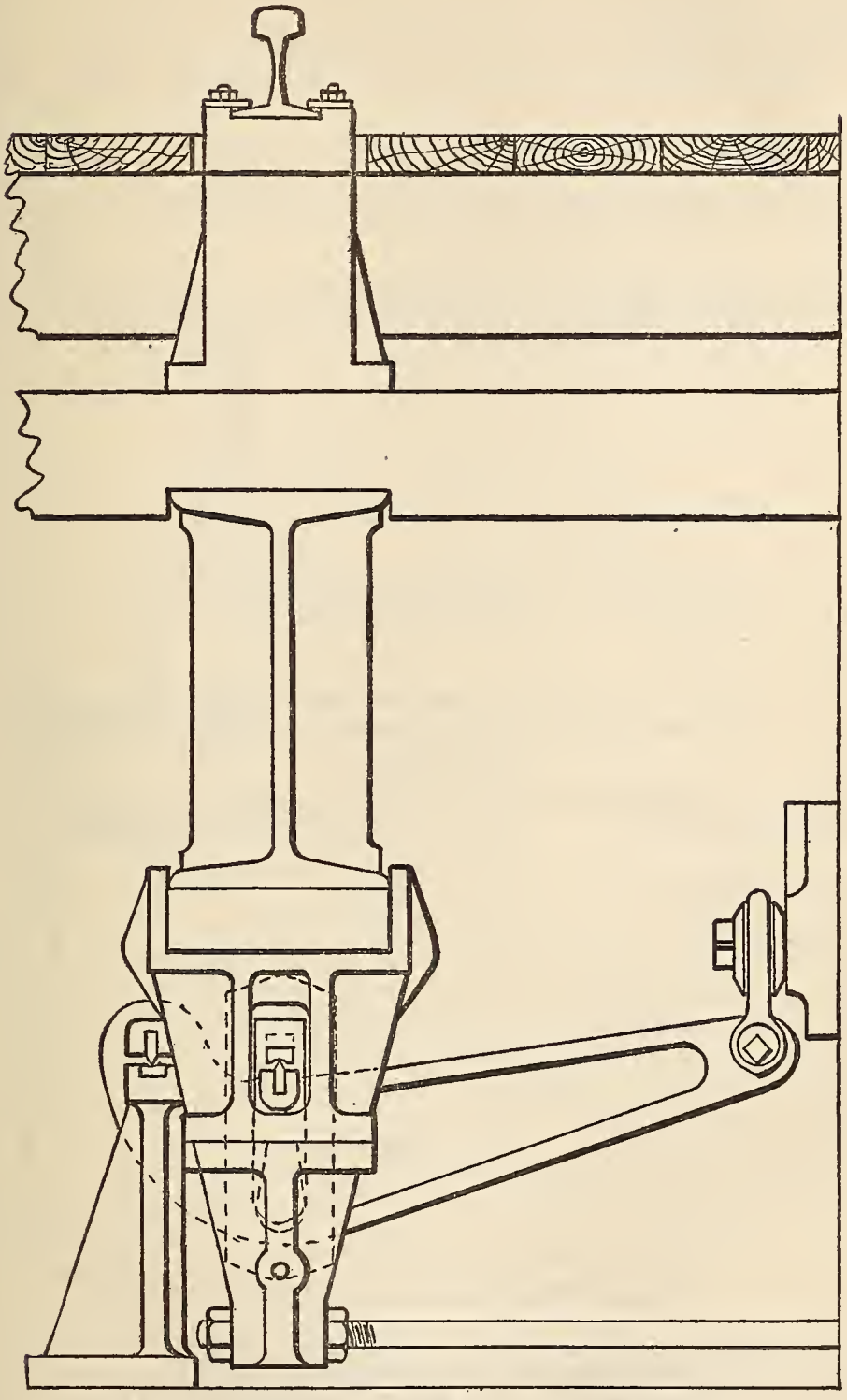

FIG. 2.—Suspension bearing and rigid deck construction.

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made of a metal which will not oxidize easily, then should be gold plated. These master weights should be used only for the purpose of comparison with the working weights and should be sent to the Bureau of Standards to be sealed and certified before being used.

The second essential is a number of working test weights, with which the actual testing should be done. The number of these neces-

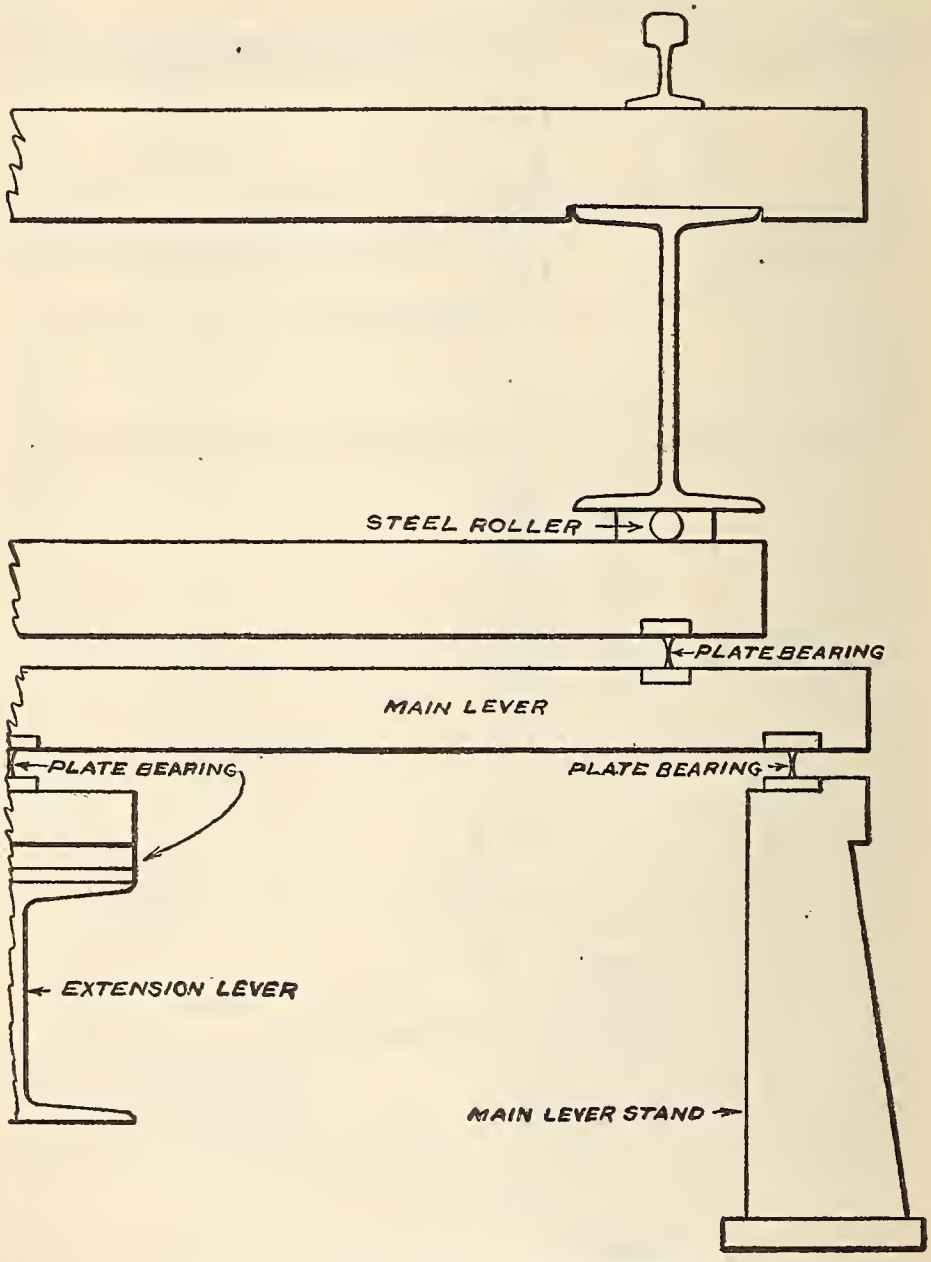

FIG. 3.—Plate fulcrum bearing construction.

sarily depends upon the number and capacity of the scales tested. I will say that the number of 50-pound weights used by the Pennsylvania is approximately 5,000. Also we have forty 5,000-pound weights; that is, 40 weights weighing 5,000 pounds each. The latter are exceedingly useful in testing master-track scales, as well as iron-

ore scales. These weights are used in testing about 4,000 scales of various sizes and capacities.

The third essential in equipment is one or more master scales suitable for weighing weights from grains up to 50 pounds. As much care should be used in the maintenance of the master scales as in the maintenance of the weights. It is very desirable, although not absolutely necessary, to have a master-track scale for the purpose of weighing scale cars. The capacity of this scale should be heavy enough to weigh accurately the heaviest scale car that may be desired.

The fourth essential is one or more scale cars, the number depending on the number of scales to be tested. The wheel base of the scale car should not be over 7 feet. The design should be such that it will not be necessary to carry any loose weights in the car, almost the entire weight being cast into the body. The design should provide for the fewest possible loose parts which can become lost, as, for instance, the grab irons or steps. This car should not be used for transporting repair parts, tools, etc. It is really a portable master weight—a scale car in the strictest sense of the word. It should be weighed at stated periods on the master-track scale, after first being carefully inspected to see if it requires any repairs. At this time also the journal boxes should be repacked with waste and oil. After the car is weighed, the locks on all the compartments should be sealed, these seals not to be broken except on the authority of the head of the scale department. The object of all these precautions is to guard jealously the known weight of the car. If the journals are provided with roller bearings, such a car may be moved by hand, and with it a scale can be tested in a very short time. This is a great advantage in many places where traffic is heavy.

With such equipment as I have just described, a scale inspector's battle is nine-tenths won. The use which he makes of the scale car should interest the State, county, and city sealers of weights and measures as much as the railroad inspectors.

To test a scale with one car, we balance the scale and place the car on it as near to the end as possible. If the weight indicated on the beam is, say 80,000 pounds, or the actual weight of the car, the car is then moved to straddle the next section; that is, the center line which is half way between the two pairs of wheels should be approximately over the center line of the main levers. The weight here should be noted also. The car should be moved thus from section to section until it has made the trip across the scale. If the weigh beam indicates the weight to be 80,000 pounds at all points, then the scale may be considered to be weighing correctly. Before arriving at this conclusion, however, the car should be run over the scale several times to ascertain if the weight indications repeat themselves without variation. If by chance any section should show an error, then the inspector should make a very close examination of the scale to ascertain if there are any defects contributing to the errors. He should also run the car over several times to ascertain if the errors repeat themselves without variation. If they do so, then he may safely conclude that they are due to multiplication in the levers. If they do not repeat themselves, but vary, then he may safely decide that they are due to some foreign interference with the members of the scale; in short, the scale is out of order. What is to be done to correct these errors in either case I shall explain later.

It is now becoming the practice to use two scale cars in testing track scales, one of them weighing 30,000 pounds and the other 80,000 pounds. Thus a light and heavier test can be made with each car alone, then a heavy test by using both cars together. A graduated test of this kind will give different values which can not otherwise be obtained very conveniently—30,000 pounds, 80,000 pounds, and 110,000 pounds. Another advantage in using two cars is that the wheel base is thereby made elastic, as the cars can be spaced to correspond to the wheel base of any of the commercial cars. This method of testing is in vogue on the Pennsylvania and is highly satisfactory. It has been approved by the American Railway Association and by the Bureau of Standards.

To return to the method of correcting errors found in a track scale, let us suppose that we are testing a four-section track scale with an

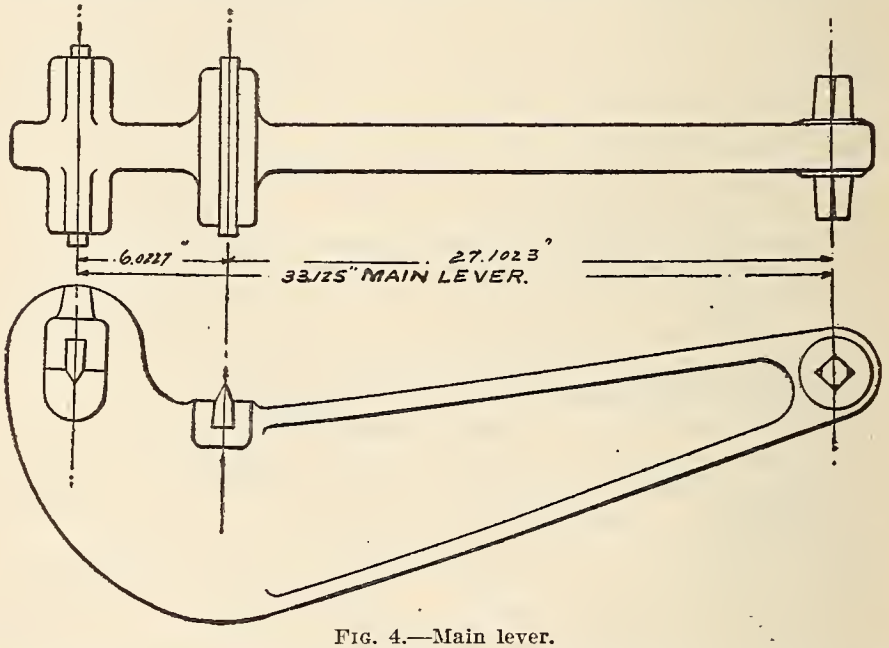

FIG. 4.—Main lever.

80,000-pound scale car, and that after running the car over the scale several times the following weights are obtained without variation:

Section 1	Section 2	Section 3	Section 4
80,000 pounds.	79,900 pounds	79,800 pounds	80,020 pounds

By dividing the difference between the minus errors and the plus errors by the number of sections—four—we find that the scale is weighing on an average of 45 pounds light. Examination reveals the fact that these errors can be eliminated by the relocation of the nose irons on the extension and transverse levers. A better way, however, is to locate the offending members, which, let us say, are main levers as shown in figure 4. These levers have no movable irons, but the trouble can be readily overcome by removing the knife edges and grinding one side if the error is minus or the other if the error is plus, thus changing the multiple of the levers or the reduction powers. This method of adjusting is very desirable as it eliminates the necessity of disturbing the vertical connections between the levers, which would be done if the nose irons were moved

materially. Errors can be eliminated from any part of the scale by removing the knife edges and pivots, and grinding, as explained in reference to the main lever.

To anyone who desires to know mathematically just how much to grind the knife edge, I offer the following method, which is used more or less by scale men: Referring to figure 4, we have the weight of the car, 80,000 pounds, the length of the main lever in question, 33.125 inches, and the error of the section, 100 pounds, minus or light. The object is to find the unknown distance, for the present denoted by x, which the knife edge is to be changed by grinding, to correct the error in the scale. The value of x, divided by the multiple 5.5 of the main lever, gives the distance to grind.

Remembering that half the weight, or 40,000 pounds, comes on one lever and assuming that the corresponding error is 50 pounds, we can write the relation in an equation thus:

$$40{,}000 : 33.125 :: 50 : x$$

$$\frac{33.125 \times 50}{40{,}000} = x$$

$$x = 0.414 \text{ inch.}$$

$$0.414 \div 5.5 = 0.075 \text{ inch, or about } 5/64 \text{ inch.}$$

As there are two supporting or main levers in a section, it will be necessary to grind them alike. It will be observed that in making

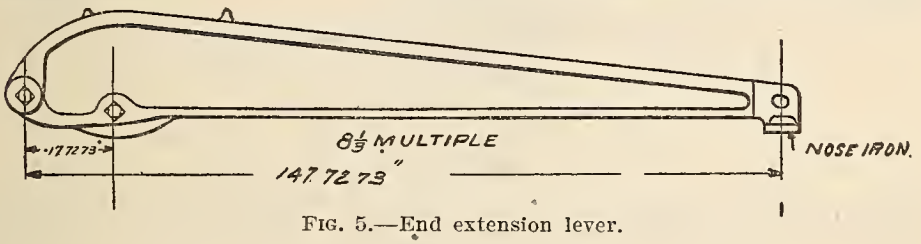

FIG. 5.—End extension lever.

this computation the weight of the scale car and also the error were divided equally between the two levers. Before grinding any knife edges an examination of the bearing-plate steel should be made to see that the knife edge is not cutting it.

For those who would like to know how to find the exact movement of each nose iron, or the exact amount to grind the knife edges on the other class of levers, I will go further into details. Assume that the weight of the scale car is 80,000 pounds, and that the following weights are obtained:

Section 1	Section 2	Section 3	Section 4
80,100 pounds	79,900 pounds	79,800 pounds	80,020 pounds

To adjust the first section, which is 100 pounds plus, or heavy, the nose iron on the end of the extension lever (fig. 5) must be moved out. To adjust the second section, which is 100 pounds minus, or light, the nose iron should be moved in the opposite direction, decreasing the length. The amount of adjustment or the distance the nose iron should be moved, depends upon the length of the lever and the amount of error. We have the weight of the car, 80,000 pounds, the length of the lever, 147.72 inches, and

the error, 100 pounds. We desire to find the exact distance, x, to move the nose iron. Therefore

$$80{,}000 : 147.72 :: 100 : x$$
$$80{,}000x = 14772$$
$$x = 0.18465 \text{ inch}$$

Since 0.18465 inch is about 3/16 inch, the lever should be lengthened that distance to correct the plus error of 100 pounds.

Referring to the second section, the length of the long arm of the middle extension lever (fig. 6) is 7 feet 6 inches, or 90 inches, the error is 100 pounds minus, or light, and the statement should be as follows:

$$80{,}000 : 90 :: 100 : x$$
$$x = \frac{90 \times 100}{80{,}000} = 0.1125 \text{ inch, which is about } 7/64 \text{ inch.}$$

As this section is weighing light, it will be necessary to move the nose iron toward the center of the lever.

The middle extension lever has two functions to perform, one being that of an even extension lever for the end section, and the other that of reducing lever for the middle section or main lever located there. All scale inspectors know, or should know, that to move the

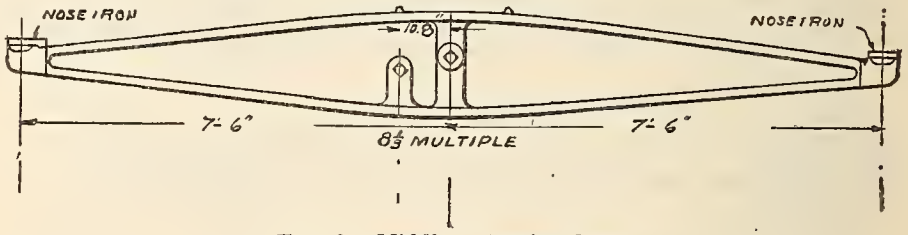

FIG. 6.—Middle extension lever.

nose iron on the middle extension lever is to disturb the multiplying powers of the levers in the end section, and therefore if the nose iron on the middle extension lever (fig. 6) is moved toward the center, the nose iron on the other end must be moved the same distance also toward the center. This will still maintain the middle extension lever as an even extension lever. Should it be seen that the movement of the nose iron on the middle extension lever (fig. 6) would seriously disturb the alignment of the vertical connections, the section can be adjusted in the middle extension lever by grinding the pivot from which the main levers are suspended. The amount of grinding can be determined by dividing 7/64, the shift of the nose iron in inches found necessary on the end of the middle extension lever, by the ratio of the lever arms, in this case $8\frac{1}{3}$, which gives 0.0135 inch, or about 1/64 inch. If it is decided to grind the knife edge, the amount necessary to grind it can be obtained directly from the relation

$$100 : 79900 :: x : 10.81$$

from which, $x = 0.0135$ inch.

After the same method of procedure has been followed out in all sections, another test should be made. If all sections weigh the car at 80,000 pounds, the scale is weighing correctly, but if it is found that all sections are weighing, say, 100 pounds heavy, then the error can be taken up by changing the length of the short arm in the transverse, or fifth, lever. This may also be stated as a problem in proportion.

The long arm of the transverse lever is 84.522 inches, the multiple of the transverse lever is 3.6, the error is 100 pounds, the weight of the car 80,000 pounds. Therefore

$$80{,}000 : 84.522 :: 100 : x.$$

Therefore $x=0.1056$, or 7/64 inch, the distance the nose iron should be moved to make the scale weigh correctly.

If it is desired to correct the error by grinding the pivot in the end of the short arm, instead of moving the nose iron on the end of the long arm, the distance to grind may be determined by dividing the value of x, 0.1056, by 3.6, which is the multiple of the transverse lever, the result being 0.029 inch, the distance to grind.

The formulas used in the preceding may be generalized as follows:

Let W=weight of test load.

E=error in indication of the scale.

L=length of the lever arm of the knife edge on which the adjustment is to be made, measured from the fulcrum knife edge.

x=amount the knife edge is to be changed.

Then,

$$x=\frac{LE}{W}$$

If the computation is made for one knife edge and for any reason it is desired to change and make the adjustment on the other knife edge, the new value of x can be obtained by multiplying or dividing by the multiplication (or the arm ratios) according to whether the first computation was based on the short arm or the long arm, respectively. The above statement may be illustrated as follows:

First. Basing the computation on the short arm. Given the length of short arm, 23.478 inches; multiple or ratio of the arms, 3.6; weight of scale car, 80,000 pounds; the error, 100 pounds; to find the value of x, the distance to grind the knife edge on the short arm. Then,

$$80{,}000 : 23.478 :: 100 : x.$$

$x=0.029$ inch, the distance to grind the knife edge in the short arm.

$0.029 \times 3.6 = 0.1056$ inch, the distance to move the nose iron in the long arm.

Second. Basing the computation on the long arm. Given the length of long arm, 84.522 inches; ratio of arms, 3.6; weight of car, 80,000 pounds; error, 100 pounds; to find value of x, the distance to move the nose iron. Then,

$$80{,}000 : 84.522 :: 100 : x.$$

$x=0.1056$ inch, the distance to move the nose iron in the long arm.

$0.1056 \div 3.6 = 0.029$ inch, the distance to grind the knife edge of the short arm.

The Acting Chairman. If anyone desires to ask Mr. Gordon a question, I am sure he would be glad to answer.

I notice we have with us to-day a very distinguished gentleman from Pennsylvania, and fearing he may leave us before this meeting closes, I am going to call upon him to say a few words to us, as he has the happy faculty of saying something instructive and interesting at all times. I take great pleasure in introducing Dr. Henry Houck, secretary of internal affairs, of the State of Pennsylvania.

REMARKS BY HENRY HOUCK, SECRETARY OF INTERNAL AFFAIRS OF PENNSYLVANIA.

Mr. Chairman and gentlemen, this is very sudden and very unexpected. I took a back seat expecting to be a good listener and not to be called upon to make any speech. You hear a great many speeches and a number of papers, and sometimes they get a little monotonous. Some time ago they had a convention of milkmen in Harrisburg, Pa., and long papers were read and long addresses made, and one gentleman from the country got a little tired and said, "Mr. President, the proceedings are getting monotonous. I think there should be a change in the program." "Well," said the president, "What would you suggest?" He replied, "I suggest we sing a song;" then the president said, "What song would you suggest?" "I would suggest that we sing, 'Shall we gather at the river?'"

So I will not detain you long. I am glad to be here and tell you that in our own State this work is in the hands of good workers and is prospering. The people of Pennsylvania are slow to take up new things, but I want to say that I do not believe that there is a measure in our statute books which is more popular to-day and more faithfully administered in every respect than that relating to weights and measures. At first there was a great deal of opposition, but I learned from Mr. Sweeney, a very competent man, that the opposition has practically disappeared. In fact, I have come to the conclusion, and long ago, that the success of the work in which you are engaged depends largely on the men doing the work. That is a great point. Wherever you have competent and agreeable men to administer the work there you will meet with success.

Our people feel very sensitive about this matter of being examined; but, so far as I know, in my State good men are in charge, and they know how to meet the people. The people at large who sell things are honest, and they mean to be honest. A man to be meddling in an unpleasant way would make a great mistake, and no matter what calling a man may be engaged in, what position in public life he holds, if he meets people in a pleasant way, that counts so very much.

I happen to have been engaged in school work for many years, and sometimes I used to be criticized for being a little severe; but I always felt better, when I left a school and could take the teacher by the hand, even though I did see some things that were not the very best, and say a good, cheering word before I left. My friends, the best part of life's work is to cheer people and make their work easier and show them the bright side of life.

Mr. Sweeney is a very efficient man, and I have had the honor of appointing him. As you all know, the weights and measures bureau has been placed under the department of internal affairs, of which I have charge; and when I tell you the people are slow in Pennsylvania to take up new things, I want also to say they have elected me three times. In the city of Harrisburg I know what is going on there, and we have a very popular, efficient man there. So, I repeat again, the success of this work depends upon the man who has charge of it. If he be cheerful and pleasant, knows his work, and is not too apt to criticize, or to tear to pieces, he is the man who is going to succeed.

If you want to ask me any questions about weights and measures, of course I will answer them, but my line of work is somewhat different. There was a time, under our constitution, when the railroads, the statistical department, the mine department, and the help departments were all placed in the department of internal affairs, but there have been changes and a good many separate departments have been created. This department of weights and measures is still with us, the governor is with us, and the legislature is with us. I have only one fault to find with the governor; that is, he did not give us all the money we wanted, but I guess he will do better the next time. We asked from the State legislature two State inspectors in order to meet the local inspectors at different places, and it was passed with very little trouble and proper salaries attached, but the governor thought we were short financially in the State and we lost out. However, we shall try again.

I think what I am saying of my own State can be said of every State, with the proper men in charge this is a great work, the greatest work the State has ever undertaken in the interest of the people, and everywhere it is being well received and conferring benefits and blessings upon the mass of our people. I thank you.

The Acting Chairman. I think you will agree with me that I made no mistake in calling on Dr. Houck. He does not have to be prepared, in order to say something interesting and instructive.

INSTALLATION AND MAINTENANCE OF TRACK SCALES, BY F. H. HEDWALL, SCALE SUPERVISOR, BOSTON & MAINE RAILROAD.

Gentlemen, I am very much pleased to have the opportunity and also the honor to speak before such a distinguished gathering. There surely are others who are better qualified to address you than I, but I shall nevertheless endeavor, to the best of my ability, to explain some matters pertaining to the installation and maintenance of track scales.

INSTALLATION.

In the installation of track scales we have the following elements to consider: (1) Location; (2) foundation; (3) drainage; (4) installation.

Location of scale.—In locating a track scale the following items should be considered: (1) Number of cars to be weighed thereon; (2) whether scale is to be equipped with a dead rail; (3) whether cars are to be weighed spotted or while in motion; (4) cost of maintenance.

A track scale should preferably be placed on a track where no switching is done; and if a scale is to be equipped with a live rail only, it should be placed on a stub track.

Foundation.—When scale is to be located the foundation should also be considered, so that the best possible location is obtained, inasmuch as the foundation is the most important item in scale building. If the foundation is as solid as the rock of Gibraltar and the installation is properly made, we will have a good weighing machine. Different methods have to be used in constructing foundations, depending on soil in which scale is to be installed. Because

we all know that corrosion is worse than wear on a scale, we should keep in mind the importance of a dry pit.

Drainage.—A gravity or natural drain, with an 8-inch tile pipe leading from the scale pit, is preferable. If a gravity drain can not be obtained, a water-tight catch basin should be built next to the neck of pit to save laying of drain pipe. On the Boston & Maine Railroad we waterproof our pits and basins by using 5 pounds of soft soap and 5 pounds of alum dissolved in 50 gallons of water, together with a mixture of 1-3-5 cement, sand, and stone.

Installation.—The deck or platform should be solid, so that weather conditions will not affect the balance. Scale should be equipped with dead rail. Pits should be properly heated to prevent freezing of scale in winter, also properly lighted to permit of inspecting and cleaning. All levers should be level and connections plumb. Wooden ties should be placed between bridge and scale rails to absorb shock, thereby lengthening life of scale. Scale should be of suspended platform type with rigid bearings. Capacity of scale is an item that should be considered very carefully.

If a scale is bought from a scale company, with a 100-ton beam, it does not necessarily mean that it will be able to carry a load of 100 tons and give good weighing results. But that is the way scales were bought up to two or three years ago.

If, for instance, a 100-ton scale is to be installed, the specifications should call for a scale with levers that would be able to carry a car of 200,000 pounds gross weight, uniformly distributed on four axles, spaced 5 feet 6 inches, 6 feet 6 inches, and 5 feet 6 inches, this load to be placed to give the maximum reactions at each support and maximum stresses in each section. Live load should also be used in proportioning the dead-rail supports and this should be a 200,000-pound car, as above, or a load of 120,000 pounds on two axles spaced 6 feet center to center. Impact allowance of one-half specification requirements. Preference should be given to a four-section scale.

MAINTENANCE.

On the Boston & Maine Railroad we have a scale department, which is composed of one scale supervisor, two scale inspectors, one scale tester, seven scale repairmen, and three men in repair shop.

Scale inspectors make frequent inspections of all track and freight-house scales, reporting their findings. They keep the scale repairmen busy and also assist in the installation of scales that are taken out for repairs.

In order to keep scales in good condition, bearings and pivots should be thoroughly cleaned and frequently oiled with oily waste, this to prevent corrosion as much as possible. Levers, I-beams, and girders should be painted with red lead. All levers should be carefully looked after to see that connections are plumb. Scale should be tested at least three times a year, with a test car of not more than 7-foot wheel base. If it is found that scale can not be brought into seal, it should be sent to repair shop for general overhauling, and while same is out, pit should be thoroughly inspected. Nose irons on track scales should be moved very seldom. Some scale people abuse the right of moving nose irons. When pivots are dull, the

multiplication of lever has very often changed, and pivots should be renewed.

The weighmasters should be instructed as to the construction of scales, so that they will be able to make such inspections as are necessary to determine if scale is in proper working condition. On the Boston & Maine system comparative tests are made weekly between the different scaling points in order to determine if scales are in proper weighing condition.

DISCUSSION.

The ACTING CHAIRMAN. Are there any questions to be asked Mr. Hedwall?

Mr. SWEENEY (of Boston). I would like to ask, How constant is the accuracy in track scales? Are there great variations when a test is repeated, and how is such accuracy obtained?

Mr. HEDWALL. I try to bring my scales within a tolerance of two-tenths of 1 per cent. Some people seem to think that is not enough, that we should allow four-tenths of 1 per cent. If the pivots are dull, I would not move the nose. I take the pivots out and have them reground. If you grind pivots very often, the main levers will lose the range, and that lever is dead absolutely. You must have some range on the levers.

Mr. SWEENEY (of Boston). How long does the scale remain accurate? Is it a fact you can go over a track scale with a test car and possibly find half an hour after that it varies?

Mr. HEDWALL. No. That scale will stay in good condition for at least three months if it is any good at all.

Mr. FARRELL. How do you figure the tolerances?

Mr. HEDWALL. If I test a scale with a 60,000-pound test car and if you allow me two-tenths of 1 per cent, that would be 2 pounds in a thousand; with a 60,000-pound car that gives 120 pounds on each section. We try to keep within that amount of tolerance.

Mr. SWEENEY (of Boston). I think that this is a subject which should be discussed because it is a growing subject, and the time is drawing near when each sealer will have to take it up. What I wanted to ask the gentlemen was—he spoke about heating the base of the track scale. What is the percentage of error that might be caused by the use of the scales in cold weather? What actual effect has cold weather on track scales?

Mr. HEDWALL. If a track scale is frozen you may get almost any weight. You might have it up two or three thousand pounds before you can break the ice away, and I have a common stove, in which I use soft coal, that takes about 2 pounds a day. We have had no trouble since we put stoves in. Some people think that the fifth lever expands too much, but it does not amount to anything. I think it a very good idea in a cold country—especially where I am, in Vermont, to have a stove. It gives satisfaction.

Mr. SWEENEY (of Boston). I would like to ask what Mr. Hedwall thinks of the proposition of building track scales on the principle of overhead hanging.

Mr. HEDWALL. I think it is a good idea. We have only one on our system and that is at Portsmouth, N. H., and we have very little

trouble with it, but some people claim it is dangerous to have suspension scales. But that scale, however, is very accurate. Of course, there is not the same amount of dampness as in a pit and they do not corrode so quickly.

The SECRETARY. There is one observation I would like to make to this body. We are frequently called upon by railroad companies to express an opinion as to whether a sealer can make a test upon a railroad track scale with, say, one or two thousand pounds of weight. Our answer is that he can not. Two or three thousand pounds will not tell me anything whatever about the accuracy of such a scale, and it seems to me that any sealer who does try to make such a test only brings discredit on himself. I would like to warn the sealers against testing if they have not the proper equipment; they should not attempt to do it as it is a mere farce.

Mr. LYTTON. Mr. Fischer, how frequently would you say the inspection of track scales and other scales should be made, if the department has the men and the equipment to do the work?

The SECRETARY. I imagine that would depend a great deal on what the scales are used for. If they are used for the weighing of grains, they should take extraordinary care of them and keep very close watch of them, indeed. Mr. McFarlane, of the State of Minnesota, where they have perhaps the most efficient track-scale inspection department of any of the States, is here and he can answer that better than I. As a rough guess I should say they should be tested once in three months.

Mr. LYTTON. In our State our appropriation has not been large and our State men are only able to test smaller scales.

The SECRETARY. You are not speaking about railroad track scales?

Mr. LYTTON. We are not equipped to do that work, but some of the men only go to a set of scales once a year. What I am getting at is, in order to have an ideal condition, should we be able to get around twice a year?

The SECRETARY. Twice a year should be enough for scales that are protected at all. I think that is about the average of inspection.

Mr. KELLY. I would like to say a few words to Mr. Fischer in regard to the statement he has just made in regard to the testing of railroad track scales with a test car. In the town where I live I have several railroad track scales which are owned by the manufacturing concerns outside of the ordinary scales the railroad companies have. I have used a railroad test car in testing railroad scales, but I have no other test car that I can use. I have constant requests from time to time to test the scales, and, in fact, I had one request just a few days before I came down here to test out a new railroad track scale installed by a company at Bridgeport, Conn. It is almost imperative that I make some sort of a reply to that request. You can understand that a sealer in a small town is constantly being called upon to test out apparatus of various kinds, and if he says he can not make the test he loses the confidence of the people. I have always replied to them and carried out the test in this way.

I have about one ton and a half of weights of my own and there are two or three concerns in the town that make brass, etc., and some of them have 1 ton and some 2 tons of brass, and I borrow this material. Sometimes I call on the county sealer and in that way I get five or six thousand pounds of weight and run a loaded car onto

the scale, after balancing the scale and building on these five or six thousand pounds of weight. That is the very best thing I can do in the way of a test, and it is my belief it gives you a fair idea of how a scale is working.

I do not think a sealer should turn down any request if he can do anything at all or if he has any sort of apparatus to take care of it. I think in one way the sealer gains the confidence of the community by replying to the various requests for attention, and I have in a great many cases been called upon to make a test of apparatus I did not understand anything about until I went over and looked it over and acquired some information in some way and found a means of making a test. I would like to ask Mr. Fischer if he does not regard that sort of test as a fair test.

The SECRETARY. I would like to say I realize the disinclination of the sealer to say that he can not make a test, but I want to warn you that if there is any kind of a dispute that kind of a test would have no value whatever. If you get into a dispute with a railroad company and they come there with a railroad car and make a test, any competent authority would rule their test was far superior to that of the sealer. We have made tests in certain parts of the country and after we got away from there the sealer, in one or two cases, came around and tested the scale with a thousand pounds and charged a fee for it after we tested it with 80,000 pounds. The railroad company protested to us against that and asked us what we thought of it. They thought it was a farce, and we also thought so.

Mr. EGAN. There are a great many track scales within the State of Connecticut, and if a legal question arose as to the accuracy of these scales, where is the authority outside of our State to determine it when it is stated in the law that the State superintendent of weights shall supervise a test? I am not at all jealous about it, but I want to get at that point.

The SECRETARY. Of course we have no authority, and I am not speaking from that point of view. You have the authority, but if you do not have the equipment I do not see how you can do it.

Mr. EGAN. That is the point.

The SECRETARY. It is solely a question of equipment, and I want that point distinctly understood. I do not want anyone to get the impression that we are arguing that because we have the equipment we have the authority. We have absolutely no authority in the matter.

Mr. EGAN. What you advise is that local inspectors of weights and measures do not undertake to inspect and certify to the inspection of track scales unless they have the equipment with which to make the inspection?

The SECRETARY. That is it exactly.

Mr. EGAN. If he has the equipment available that is recognized as sufficient to make a competent test, would you recommend that he use that?

The SECRETARY. I certainly would. I think that is done by quite a number of men, but to test a 100,000-pound scale with 1,000 pounds of weights is like testing a 1,000-pound scale with 10 pounds of weights, and no one would do that and believe they were getting an efficient test.

Mr. KELLY. Mr. Fischer speaks of using railroad track scale test cars. I have seen railroad track scale test cars used in our neighborhood, and they are very ordinary cars and not to be compared with the one used by the Bureau of Standards, but simply a collection of weights. Take it for granted, there is a certain amount of wear and tear on that equipment. There is also a question as to weight, as to whether they have been resealed within a certain time. In my town I have as much confidence in the weights of the dealer as I have in the ordinary test car. It has been in use and tried over a master-track scale. It is simply a relative value. The theory is that you have to test out a track scale the same as you would any ordinary scale, somewhere up near its capacity, in order to disclose error. But small weights will disclose errors. I fail to see where it would be a disadvantage, any more than if the test car was prepared for that purpose and we had to accept somebody's word that it was in fairly good condition. There are some places where I can not use a railroad test car, where it runs into the yard of some private corporation, and where the railroad company would not pay enough attention to it to go there with their own car. I have run this car on a balanced scale, weighed it up, a car with thirty, forty, or fifty thousand pounds in it, and added eight or ten thousand pounds in weight. I believe that gives you some sort of an idea as to the accuracy of that scale.

Any man testing scales would be reasonably sure that there was no great error if the test comes out all right under those conditions. One company wants to check up on the question of weights; they have just installed a scale, and want to know whether it is all right. I presume the scale was sold with the understanding that if the sealer said the scale was all right the bill would go through. They want some way of checking up on scales to see whether it is all right. One great trouble with manufacturing companies is that they frequently have the carpenter department install the scales. A short time ago I was up at one plant for nine days going over some of their equipment. They have, perhaps, the largest amount of high-grade steel anywhere in New England—hundreds of thousands of dollars worth of steel that runs up in some cases to $3.85 a pound. It is imperative that they check up on this material, both in the handling from one department to another and also when it comes in. I went over their scales and found some of them in very bad condition; the scales were installed by the carpenter department and disclosed very peculiar situations the way they weighed up. Over 50 per cent had to be taken down and reinstalled by scale men. I told them at the time that one of their great difficulties was that they did not have a scale man put the scales up. They could not see that. They have a very elaborate engineering department, but they could not see my side of it at all. They have some of the highest-priced workmen in the world and some of the finest mechanics, but they did not know enough to handle the scale proposition. After I went out there and showed them I said, "There are the results; you bought this knocked down and assembled it yourself; in my judgment, it is a mistake." They wanted me to test that scale, and that was the only way I had of testing it. I did not think it just the right thing to turn them down and say, "No; wait until I get a test car."

Mr. Davis. I would suggest to Mr. Kelly in regard to the test on track scales that he have the owner of the track scale make a request of the railroad company in that community to test the scales under the supervision of the sealer. It is entirely misleading to attempt to test a track scale with three or four thousand pounds of weights. We will assume it is new, and if he puts on 1,000 pounds he may not be able to find an error of 10 pounds. On 80,000 pounds he would have an 800-pound error. It is entirely unfair to railroads and individuals to say that the sealer of weights and measures has approved their scales, and then find they have made a very inadequate test. We get into these disputes occasionally, and it becomes a question of fact as to who is right. We dislike to say that the sealer has inadequate facilities for testing the scales although able to show by our test that his tests are not good, so it puts the railroad companies in an embarrassing position. I say that most railroads maintain fairly good testing equipment at the present time, and the Bureau of Standards is now testing all railroad master scales throughout the United States on which the railroads will seal their test cars. A large concern may be buying coal weighed by some railroad and their scales may be out only 10 pounds in a thousand pounds of weight, but that amounts to 800 pounds in 80,000. They may get possibly 8 or 10 cars of coal and they check the coal weighing 800 pounds light in the car, and then the shipper has a great big complaint on his hands to straighten out.

I have another case in mind that happened recently of an elevator hopper scale, a 100,000-pound scale installed in first-class condition, and it was apparently correct. The shipper invited us in to make an inspection of that scale. Our scale inspector put about 15,000 pounds of weights on it and found it weighing 100 pounds off on each corner; that would make about 400 pounds in a 60,000-pound carload of weight. The railroads were paying claims on a great many cars based on that shortage. That scale also had the seal of the sealer of weights and measures on it. I think if the States are going to undertake to test scales, they should do it in the proper manner, and they should have accurate weights to work with.

Mr. Farrell. The scale men of the different railroads may not be as competent as a man from the Baltimore & Ohio. I found one prominent railroad track scale man in the State of New York down in the pit one day with an oil can in his hands oiling up all of the pivots.

Mr. Briggs. It seems to be the tendency to confuse expediency with facts or physical difficulties. To come back to the original discussion by Mr. Kelly, it might be said that it has been verbally reported to me that local sealers have tested and passed railroad tracks scales which failed to pass on a test by the Bureau of Standards, and the railroads concluded to take them out and put in new scales. There is no doubt the local sealer is interested in some railroad track scales, and it seems to me the best solution is to cooperate with the railroads. That is not saying that all of the railroads have an efficient weighing equipment.

When you are making a test with a small amount of weights it should not be forgotten that the test is still more or less in question.

One thing brought out by this discussion is the total lack of organization which should exist for carrying the standard from our test cars to the master scales, and from the master scales consistently

to the railroad track scales in the cities in which it might be presumed the local sealers have an interest. What is necessary there, is an organization to make a careful review of the efficiency of the equipment of the local railroads, and then to see that the test is carried out in a proper manner.

Mr. GORDON. I think the attitude Mr. Fischer has taken in regard to the sealer testing track scales with a small amount of weights is correct. It has been my experience that the use of a small number of weights is not sufficient, for the reason that even a 60,000-pound scale car is not always sufficient. It has been my experience in running a scale car over a scale that all sections may weigh correctly; but I have encouraged our men before they leave the test to run a very heavy car on the scales—the heaviest they can get, say, weighing 150,000 pounds; a short-space car—and then weigh that. That would be about the same thing as striking an empty balance. After they weigh the car they run the scale car on, and it has been my experience that some scales will fall down on this heavy test. The reason for that I will explain to you: Take a 60,000-pound car and run it over a scale, and you will get probably all sections weighing alike. Apparently the scale is weighing correctly; but that is not conclusive. When a State or city sealer makes a test of a track scale I think he should qualify his statement, when he makes his report, in this way: He may state he is reasonably sure the scale is weighing correctly, but it is not conclusive, because if he puts on a 150,000-pound car and then puts his scale car on, the scale may show possibly several hundred pounds out of the way. I have encouraged our fellows to make that kind of a test, and I believe the Baltimore & Ohio does that. Here [indicating on diagram] you have a nice edge on the main lever, and above that you have steel. If you take the ordinary scale car, you may get a correct reading all the way through; but at the same time there may be a fracture of that steel which is so slight that you can not discover it. By putting on a commercial car weighing 150,000 pounds this knife-edge enters that fracture and it changes the multiplication of the main lever, and therefore it makes the scale weigh light or heavy. Where you put an extra weight on a track scale you get a concentrated load brought here [indicating on diagram], and my experience has been if that is not properly tempered, or if it is overtempered, it fractures; but this fact is not discernable with an ordinary scale car. Therefore I think the city sealers in testing track scales should qualify their reports and say that the test is not conclusive.

Mr. FARR. In California we do not presume to be any more progressive than they are in any other State in the Union, but my chief is working in perfect harmony with the railroad systems, and we have two of the greatest systems in the world in California. The Santa Fe and the Southern Pacific both maintain their track scales and car, and in San Francisco they also maintain their master scale. These scale-testing cars are sent over the master scales every so often. I am a county sealer, and their test car is sent through the county when I request it. We meet them at the first track scale, and our transportation is afforded us by the railroad company. We live in the car with the sealer, and we go over all of the scales, and if any controversy arises within two or three months thereafter the railroad company immediately sends their test car to the county sealer. If

the controversy is of any importance, he takes it up through the State superintendent, Mr. Johnson, who takes it up with the railroad company, and they in every way cooperate with us.

I think if the county and city sealers will act through their State commisioners and have them go to the railroads and explain their case in detail and be courteous to the railroad, they will cooperate in every way, manner, shape, and form. The railroad companies have shown that they desire to have their scales accurate at all times.

Mr. JOHNSON. I might supplement Mr. Farr's remarks by saying that the two railroad track scale cars employed in California have a capacity of 30,000 pounds each. The master scale on which these track scales are certified is entirely under the control of the State department. Upon a recent inspection of the scale by the Bureau of Standards car they found this scale was not as nearly correct as it ought to be, and as a consequence the scale has been condemned.

It is the purpose of the State department to buid a railroad track or master scale in California owned by the people. We will locate this scale at a point where all of the railroads join, and we will certify to the accuracy of the railroad test cars about every two or three months.

In the inspection of the railroad track scales the sealer accompanies the inspector of the road, and he issues the same kind of ticket of inspection as he does to the average groceryman. A report of the test, describing the construction of the apparatus and giving the manufacturer's name, is forwarded to Sacramento, where we have about four records a year of the different scales.

We also regulate the tare on freight cars, and we are going to institute a system under which all of the freight cars used in the State will be weighed at least every two years. We contend that the tare of the car is equally as important in figuring up the net weight of the commodity contained therein as the gross weight of the car and commodity. So we have an excellent check on railroad track scales and we work in perfect harmony with the transcontinental railroad companies, and whenever we have reason to believe that there is a short weight of commodities, or that the railroads exceed their tariff basis, we get our report on the various track scales through our county sealers.

We maintain a most excellent check on the tare, on the gross, and also on the scales and apparatus used by the railroads. We find that the railroads take a great deal of interest and maintain an excellent standard of efficiency, and they have virtually given to the State departments entire supervision over their men. I can direct their men to go to any point. I think it excellent to establish these relations between the department and the carriers.

Mr. LINCOLN. We spent a month last year with the Bureau of Standards scale-test car in Michigan. We examined all the test cars of the different railroads, and we found various sorts of cars. We found old wooden cars with 2 tons of weights in them. The greatest railroad in Michigan had that type of car. We found we had to place a heavy weight upon a scale to give it a good test. When the bureau put on 40,000 pounds of weight the scale might show up well, but when we put 80,000 pounds on the scale the defects became apparent. Therefore you want to have a car of sufficient weight, or

test weights sufficient in number to give a scale a really thorough test.

While we are talking about that subject, we are having some little trouble in Michigan with one of the companies. They take the net weight of the car, but this weight varies, for in the winter-time you may find 2 or 3 inches of ice in the car; the result is that I have found cars running from 3 to 4 tons of coal short. The shippers have on all of their invoices and their letterheads this statement, "Railroad weights at point of shipment to govern settlement," and when you take it up with the mine owners they claim that clause is part of the contract, and the attorney general of our State says this is correct. If you go to the railroad, they will say that they do not enter into the commercial transaction in any way, shape, or manner, and they further say that they have an opinion from the Secretary of Commerce—which I am going to look into to-day—that we have no jurisdiction over any of them.

If you men have any experience in dealing with that kind of work I wish you would tell me how you have handled it in order to get rid of that shortage in coal cars. I kept track of one small firm, and they ran short by 100,000 pounds. That was in a town of 2,000 inhabitants. It is a question of how to deal with that situation.

The Secretary. Mr. Chairman, before anything else is said I would like to say that I doubt very much whether anybody has any certificate from the Department of Commerce of the kind mentioned. The Department of Commerce has absolutely no authority, so far as I know, to issue any such certificate. I can not imagine any bureau in the Department of Commerce that would have any authority to give any such certificate, and I would insist upon seeing a certificate of that kind.

Mr. Lincoln. I took it up with the weighmaster on the railroad, and he claimed he had that certificate, and I told him I would have him arrested as a weighmaster. He claimed he had a commission without compensation; that they were appointed by the railroad company's weighing bureau, and that they had some authority from the Secretary of Commerce.

Mr. Davis. The practice there, I presume, is that the weighmaster is the sworn weighmaster of the weighing and inspection bureau, which is an organization of the railroads in that country. In other words, he takes oath to perform his duties accurately.

So far as ice in coal cars at destination is concerned, that is probably frozen in the bottom of the car and is left in there. The position of the railroads in that respect is that the consignee should clean out whatever is put into the car by the shipper. The railroads are not expected to clean out part of the lading or haul any part of the lading back to the mines that the shipper puts into the car. Further, the railroad's position is, that so far as invoices are concerned, they have nothing to do with invoice weights. They obtain weights for assessment of charges only.

The Acting Chairman. We have had some experience along that line, and in justice to the railroads I might state that in weighing about 15 different carloads of coal in our State we found as many over as we did under. On the whole it is about correct. They do have a great deal of trouble with coal being stolen in transit, and I

understand they have private detectives and officers along the route to correct that.

Mr. LINCOLN. Our coal mines are in sections where there are very few inhabitants. If anyone should take coal off a car in those small towns they would not be very popular there and would soon be found out. I find that 9 out of 10 cars will be short in the wintertime, and the ice and snow will gather in transit when the car is empty, if at no other time. So it seems necessary to get the railroads to reweigh their cars.

The ACTING CHAIRMAN. Gentlemen, it is getting late and we have not had the report of the secretary, so I take pleasure in introducing this morning Mr. L. A. Fischer, who will read his report for the past year.

REPORT OF THE SECRETARY, L. A. FISCHER, CHIEF OF DIVISION OF WEIGHTS AND MEASURES, BUREAU OF STANDARDS.

Since the activities of our conference as such are limited almost entirely to what we do at our annual meetings here in Washington, it has been the habit of your secretary in the past to review briefly the weights and measures situation in general, paying particular attention to what has been done or attempted by the Federal Government or by Congress, and that will be done in the present case. I am excluded from talking about what is done by the States by the fact that what they have done can more authoritatively and better be told by the State delegates in the time allotted to them.

During the year your secretary attended meetings of the weights and measures associations of Pennsylvania, New Jersey, and Massachusetts, and also the annual convention of the National League of Commission Merchants, in Indianapolis, and the National Association of Lime Manufacturers, in Cleveland, at all of which I was required to give talks. I also visited, while out West, Mr. Buchtel in Oregon, Mr. Rinehart at Seattle, and the Chicago office of weights and measures.

In company with Mr. Holbrook, I visited the Eastern Shore of Virginia to study the potato-barrel situation in that territory, with a view to drafting the rules and regulations required by the act establishing the standard barrel. In every place visited I found a very great interest in the subject of weights and measures, particularly in their standardization. This interest has manifested itself by the introduction of an unusual number of bills in Congress, the provisions of which I shall attempt to outline briefly.

The first that I shall discuss is H. R. 150, introduced by Mr. Dillon. Section 1 of this bill fixes the weight per bushel of various dry commodities; section 2 makes it unlawful to buy or sell by any other weights per bushel than those provided for in section 1; section 3 gives the Bureau of Standards authority to promulgate rules and regulations for carrying into effect the provisions of the act, and also to give instructions and advice as to the methods to be used in testing all weights and weighing devices, which instructions and advice shall govern the procedure to be followed by all weights and measures officials in the United States.

The information that this bill was a substitute for the Ashbrook bill was very generally circulated among weights and measures of-

ficials, but without any basis whatever. The identical bill was introduced by Mr. Dillon during the previous Congress and created no interest whatever then, nor would it have done so when reintroduced this year except for the publicity given to it by one of our scale companies who professed to see in it a scheme on the part of the Bureau of Standards to usurp the authority and functions of the State and local weights and measures officials.

The second bill (H. R. 151), also introduced by Mr. Dillon, of South Dakota, has for its object the establishment of the metric system of weights and measures after July 1, 1924, as the sole legal system in the United States.

The introduction of this bill stirred up those who wish to continue the use of our time-honored but cumbersome system of liquid and dry measures and troy and avoirdupois weights, with the avoirdupois pound larger than the troy pound but with the troy ounce larger than the avoirdupois ounce. Owing to the fact that both England and the United States have been forced to use the metric system in fulfilling their contracts for war supplies for the continental countries, the manufacturers have been compelled to use the system, and there are many evidences that they are beginning to like it. It therefore behooves you, as weights and measures officials, to study the system, so as to be in a position to discuss intelligently the advantages in its use and the difficulties to be overcome in its introduction. I should like to say more on this subject, because I believe it is a live one, but we have a very able committee on the metric system, and I have no doubt but what the report of the chairman, Mr. Hartigan, will say anything that I might say, very much better.

Two bills (H. R. 361 and H. R. 430), the first introduced by Mr. Raker, of California, and the second by Mr. Dill, of Washington, aim to standardize the apple box. Although bills having a similar purpose received considerable support in previous years, the two bills mentioned have not been given a hearing, and, so far as I have been able to learn, are not likely to be given consideration in the near future. The main support for a standard apple box comes from the apple growers in California, Oregon, and Washington.

A bill of some interest to sealers is H. R. 4743, introduced by Mr. Burke, of Wisconsin. The purpose of this bill is to amend the food and drugs act so as to exempt packages of cheese weighing not to exceed 7 pounds from the net-weight requirements. I do not know what influences are back of this bill nor what their arguments are, but I hardly believe this bill can pass in its present form.

The next bill of interest to sealers is H. R. 5759, introduced by Mr. Cary, of Wisconsin, which reads as follows:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Director of the Bureau of Standards shall have authority to approve the type, plan, or working principle of any weighing, measuring, or computing device which is found by him to be of such design or construction as to give correct results in terms of standard weights or measures or any values with reference to such weights or measures; and with reference to any such device so approved to fix and establish necesssary tolerances, permissible variations, or margins of error which may be allowed in the use of such device.

The next bill of interest is H. R. 9323, introduced by Mr. Ashbrook, of Ohio. This bill is identical with the one introduced by

Mr. Ashbrook during the last Congress. Briefly, the purpose of this bill, as most of you know, is to give the Bureau of Standards authority to approve the various types of weighing and measuring devices which may lawfully be used in trade, provided, of course, that they conform to the standards which are fixed by the bill as those which have heretofore been customarily used or legalized. This is a carefully drawn measure and is indorsed by the bureau. It has also been indorsed by every weights and measures association in the country, including this conference. After a hearing, at which one of the scale companies opposed and another favored its passage, it was unanimously reported to the House of Representatives on March 20, 1916, and the prospects for it becoming a law seemed to be very good indeed. However, at a meeting of the Committee on Coinage, Weights, and Measures held about two weeks ago, the bill was again discussed and the chairman of the committee was requested to appoint a special committee to amend the bill so as to limit the control of types by the bureau to weighing and measuring devices bought or sold in interstate commerce, and that is where the matter now rests. The fate of this bill will be a test of the ability of the weights and measures officials of the country to secure legislation vital to the cause of honest weights and measures, and it is to be hoped that you will not permit your judgments to be warped by ingenious arguments intended to blind you to the merits of the bill.

A bill of some interest to sealers is H. R. 10496, introduced by Mr. Barkley, of Kentucky, and referred to the Committee on Interstate and Foreign Commerce. The purpose of this bill is to prohibit the introduction into interstate commerce of any misbranded article; it being deemed to be misbranded under section 6:

First. If it be an imitation of, or offered for sale under the name of, another article.

Second. If the contents of the package as originally put up shall have been removed in whole or in part and other contents shall have been placed therein.

Third. If in package form and the contents are stated in terms of weight, measure, numerical count, or quality they are not plainly and correctly stated on the outside of the package.

Fourth. If there is stamped, stenciled, branded, engraved, printed, embossed, or otherwise marked upon such article or commodity, or upon any label, tag, card, or other appendage attached thereto, or upon any box, barrel, package, cover, wrapper, or other receptacle, inclosing or incasing the same, any word, statement, symbol, design, device, or indication which is false, fraudulent, deceptive, or misleading as to its weight or measure, or as to the State, District, Territory, possession, or country in which it is manufactured or produced, as to the materials or substances of which it is composed, as to the mode of its manufacture or production, as to being the subject of an existing patent or copyright, as to its being the manufacture, product, or merchandise of any person other than the person whose manufacture, product, or merchandise it is in fact, or which indicates or is designed, intended, or calculated to indicate that the article or commodity is of a character or quality superior to, or otherwise different from its real character or quality, or that it is an article or commodity known by some other distinct name, or if there are applied thereto the name or initials of any person in any false, inaccurate, misleading, or deceptive manner, or which is false, misleading, or deceptive in any other particular.

Fifth. Or if there is published, issued, or circulated concerning, regarding, or in any manner pertaining to said article, in any newspaper, magazine, book, pamphlet, circular, or other printed publication or advertisement any false, fraudulent, misleading, or deceptive word, statement, representation, symbol, or device as to any of the matters or things stipulated in the foregoing subsections of this section.

This bill is modeled upon the lines of the food and drugs act to which it is offered as an amendment. I must confess that I know nothing whatever as to the origin of this bill nor as to the amount of consideration that Congress has given it or is likely to give it. I have merely included it in my report because of the reference to weights and measures in the fourth paragraph of section 6.

We next come to one of the most interesting bills from a weights and measures point of view now before Congress. I refer to H. R. 14188, introduced by Mr. Gould, of New York, the purpose of which is to fix the standard for Climax baskets for grapes and other fruits, vegetables, and other dry commodities. Section 1 of this bill provides that the standards for Climax baskets shall be a 2-quart, a 4-quart, and a 12-quart size, respectively, and specifies with great minuteness the dimensions of the baskets. Section 2 makes it unlawful to manufacture, sell, offer, or expose for sale in any State, Territory, or the District of Columbia, or to ship from any State, Territory, or the District of Columbia to any other State, Territory, or the District of Columbia baskets containing grapes or other dry commodities of a less capacity than standard baskets defined in section 1.

If the purpose of this bill is to regulate the sale of grapes, it fails to accomplish the purpose, since if grapes are sold in baskets of any other type than the Climax type they do not come under the law, even if the baskets are of less capacity than the standard fixed in section 1. If, on the other hand, it is intended to require all Climax baskets to be of the specified dimensions, it fails to accomplish this purpose because the penalties only apply to Climax baskets of less capacity than the standard.

The bill has the support of the Climax-box manufacturers who apparently have succeeded in convincing many Members of Congress of the importance of the measure. This bill has suggested the desirability of standardizing the capacity of all shipping baskets, crates, boxes, etc., and I hope that the delegates may find an opportunity to express their views as to the number of different sizes that they believe to be necessary before the conference is over. It has been suggested that if the sizes are limited to 1 pint, 1 quart, 2 quarts, 4 quarts, 8 quarts, 16 quarts, and 32 quarts, with one or two intermediate capacities, all the needs of legitimate trade would be satisfied, but there appears to be other views on this point.

The next bill of interest is H. R. 14298, introduced in the House by Mr. Hay, of Virginia, and in the Senate by Senator Clapp, of Minnesota. The purpose of this bill is to regulate the sale of lime in barrels by establishing a large and a small barrel of lime, the large barrel to consist of 280 pounds and the small barrel to consist of 180 pounds, net weight. These weights were adopted at the Cleveland meeting of the National Association of Lime Manufacturers and the bill has the support of that association.

There are some features of the bill which we at the bureau do not like, but our preference for a weight standard for all commodities, whenever practicable, rather than a volume standard overcame our

objections, and the bill has been approved by the bureau. We should have preferred a single barrel of 200 pounds net, but so far as we were able to determine the 180-pound net barrel, or 200-pound gross, is in very general use throughout the country, while the 280-pound net or 300-pound gross barrel is also largely used.

Some of the lime manufacturers were very anxious to have the bill passed before July 1, 1916, in order that they might be exempted from the provisions of the standard-barrel law, but the prospect for the passage of the bill does not look encouraging at this time.

Two bills, H. R. 14945 and H. R. 14976, introduced by Mr. Shallenberger, of Nebraska, and Mr. Hilliard, of Colorado, respectively, appear to be identical in their wording. The purpose of both is to fix the sizes of baskets or other open containers for small fruits and berries. The sizes specified are the one-half pint, the pint, the quart, and multiples of the quart, and without having compared them I should say that the bills are exactly like the Lodge and Peters bills which used to be regularly introduced in the Senate and House some years ago and as regularly indorsed by this conference.

The above rather long list represents, so far as we know, all the bills now pending before Congress. I regret that we can not furnish all of you with copies of these bills at this time, but we have only been able to secure a few copies of each. No doubt Dr. Stratton will be glad to supply you with copies after July 1, 1916, when our appropriation for the next fiscal year becomes available. I shall now leave the subject of legislation and say a few words about the work of the bureau.

Since you were here last year we have added a second railroad track scale-testing equipment. The design and operation of this equipment is practically the same as our first equipment, which most of you have seen. The new car has a greater carrying capacity and with the exception of the floor is all of steel.

During the year representative surveys were made in Alabama, Louisiana, Massachusetts, Michigan, Mississippi, New Jersey, and Tennessee. Since June 1, 1915, over 300 scales, located in 20 different States, have been tested, and since this investigation was inaugurated over 631 scales in 30 States have been examined.

With the cooperation of the railroads the bureau is now conducting tests of the 20 master scales scattered over the country from eastern Pennsylvania to San Francisco and from Houston, Tex., to Minneapolis, Minn. This work will furnish a valuable check on standardization of the master scales by the roads and will also enable the roads to make direct comparison of their test cars with the 10,000-pound standards of the bureau.

A few months ago the bureau issued a preliminary circular on track scales and invited criticism. As a result many valuable suggestions have been received, which will be incorporated in the final circular.

The foregoing represent the most important items not likely to be covered by anyone else. If I have not been sufficiently explicit in my report, I shall be glad to give additional information if requested.

DISCUSSION OF PROPER METHOD OF SALE OF FRUITS, VEGETABLES, ETC., IN CONNECTION WITH THE SECRETARY'S REPORT.

The ACTING CHAIRMAN. I would like to ask Mr. Fischer one question in reference to the Dillon bill, known as H. R. 150, which prescribes weights per bushel. Is it the intent of the bill to eliminate the use of dry measures and is it constitutional?

The SECRETARY. My opinion, based on what has been said about the Dillon bill at the hearings, is that that is what it is intended to accomplish—do away with the bushel measure. Mr. Dillon wants to have the bushel of a definite weight. That is what we are all in favor of if it can be done.

The ACTING CHAIRMAN. Why not say 50 pounds or 100 pounds instead of so many bushels?

The SECRETARY. I think the California people have a better suggestion than that.

Mr. JOHNSON. On that subject I want to inform you that we do not recognize dry measures in California at all. All the commodities there are bought and sold by avoirdupois weight, and whenever we standardize any commodity in containers, we standardize it by weight. We do not use the dry measure at all, and we find these conditions are acceptable to the trade, cause fewer errors, and are more satisfactory.

The ACTING CHAIRMAN. I was wondering whether, if the Federal Government allowed the use of dry measures, any State could prohibit their use?

The SECRETARY. I might state that Congress has never adopted the bushel or any other of our customary weights and measures. They have recognized them, and that is about all. The resolution furnishing the standards to the States simply required that copies of the standards adopted by the Treasury Department be furnished to the States. The only other reference we have to bushels or gallons is where Congress recognizes them in the tariff act. The gallon has been standardized for internal-revenue purposes, and the troy pound was at one time a standard for the regulation of coinage. Those are the only two cases where I can recall Congress has defined standards of weight or measure.

Mr. REICHMANN. I do not think that we need worry as to whether this is constitutional or not. We can let Congress decide that. Of course, there is a clean-cut decision between legalizing things by weight and doing away with dry measures. But it is a decided step backwards to legalize weight per bushel for certain things. Take all the confusion that exists in the States to-day—for instance, the different kinds of bushels—you will find a bushel of apples weighing a certain amount, and yet nobody in the United States can tell you what that bushel of apples will weigh before weighing them.

If you want an ideal bill as to weight per bushel of commodities you have to specify the season and the barometric pressure, and the amount of mud that is in the package. Why not do away with all of that and just specify that certain things should be sold by weight?

I take it that the Dillon bill is a decided step backward and would hamper not only the sealers but all commercial work. I think that

some criticism can be launched against some of these grape-basket bills—for instance, the Climax-basket bill. In the State of New York some years ago—and I take the liberty of speaking of it because it came up a number of years ago—the grape baskets were in a very bad condition, and we specified by law that baskets should be of a certain size. That law was to be changed and the grape-basket people got together and carefully specified just what kind and size of grape baskets they wanted. They got a lot of political support since they had a great deal of influence, and the bill was passed and signed. It had not been signed two weeks before 50 per cent of the grape-basket manufacturers and grape growers said that the bill was wrong; that they had made mistakes, and each one had made a different kind of mistake. Therefore the grape-basket and fruit-basket situation is not satisfactory to this day.

The berry-box manufacturers and berry growers were very much agitated about berry boxes, and they got a law passed requiring certain sizes of berry boxes. The law allowed a variation of 7 per cent. That law had not been signed two weeks before the berry-box manufacturers were kicking about it. Some said that 7 per cent was not enough and some said it was too much. The bill was drawn at their own convention. Some one had a hobby and brought it up.

Why not, then, do away with the measure proposition and specify that certain things shall be sold by weight, or do away with all that and say, "Whatever is sold shall be marked as per bill 10497," or something like that? That seems to be a much fairer and more equitable proposition and a great deal simpler one for the sealer than a lot of these other bills that complicate matters.

Mr. FARRELL. In New York State we have a law, something like this pending Dillon bill, which says that beans shall weigh so many pounds to the bushel. I had a request from a northern town in the State asking me how many pounds of red lima beans there should be in the bushel. I wrote back and said so many pounds. The fellow wrote a personal letter, and I found there were about 168 different kinds of beans, all of different weights. But our law says that beans shall weigh so many pounds to a bushel. If there are 168 different kinds of beans, each different variety of beans in each different locality would have a different weight. It would take 14 columns at least 7 feet long to give the different weights. Therefore I suggest that it would be better to have farm produce sold by weight, and the different localities will fix how much per bushel without legislation.

Mr. SWEENEY (of Boston). I would like to state for Massachusetts that we have rather a peculiar condition there. Although we have made a great deal of headway in the sale of certain commodities, we have standards established for bushels, half bushels, and the various dry measures that are used in the usual course of trade. But in addition to that we have a law there which states that certain commodities, vegetables and farm products, shall be sold by weight. Nevertheless, it is rather confusing, as Dr. Reichmann has stated. Usually a person will ask for a peck of potatoes and anticipate getting 15 pounds. Fifteen pounds is something distinctive in itself; it represents weight, while a bushel has been

recognized for years as a measure of definite cubical capacity. It seems to me that there should be some distinction, that they should not be confused, and I think if we want to accomplish anything that we should not stop at discussion, but we should subsequently take some action.

In Massachusetts, so far as berries are concerned, we have a law which states that they shall be sold by the half pint, pint, and quart. We have no tolerance on berry baskets, but, owing to the fact that the boxes are made of material which must necessarily permit of shrinkage, we assume to give them a certain tolerance. We also have a law which requires that the manufacturer who sells a berry basket which does not conform to the standard is liable to a fine, but, as a matter of fact, the large percentage of berry boxes manufactured come from the States in which berries are raised. It seems to me that the best way to accomplish results in establishing uniformity would be to advocate a national bill which would require berries to go by definite measure, and require the manufacturer to guarantee the boxes, permitting him a reasonable tolerance.

Mr. CARPENTER. I want to say that we raise some beans in Vermont; there were over 50,000 bushels taken out of one county this fall. Recently I had a talk with one man who purchased nearly 50 per cent of this output, and I believe it would facilitate matters there, and I believe the people would indorse any action that would require the sale of beans or any other commodity absolutely on a weight basis.

They have up there just as many different kinds of beans as they do in New York, and a bushel of lima beans and a bushel of red beans are altogether two different things, but 10 pounds of beans is the same thing. I think we are unanimously agreed that if it is possible and constitutional these commodities should be sold by weight only. I do not believe there is anyone who would object to that, and I think it would be a good idea for this association to go on record as indorsing some Federal legislation which would require commodities, whether potatoes, beans, or vegetables, to be sold by weight, and by weight only.

Mr. STRATTON. In this connection I will state that I attended a hearing before the Coinage, Weights, and Measures Committee when this bushel bill was under consideration, and I was greatly surprised and pleased to find that these men were all thinking about this weight proposition. There were two or three of them who took the greatest interest in the matter. There was present a representative from Nebraska and one from Iowa, and they had quite a discussion as to the selling of wheat and other commodities by weight. One of the gentlemen gave a very interesting experience. It seems that an individual in one of the States bought a lot of grass seed from another State, supposing the number of pounds per bushel was the same as in his own State. He calculated the amount of seed required, and when he got the seed he found it was three-fourths of what he wanted, and it resulted in serious inconvenience to him. That was due to the different number of pounds per bushel in two different States. One after the other gave interesting experiences.

Clinging somewhat tenaciously to the bushel proposition, it would seem they feared a change might cause a great deal of confusion and difficulty, but at the same time I think they felt that sooner or

later they must come to that one point, and the whole hearing turned into a discussion of this bill among the members of the committee themselves.

I believe if some good, simple, straightforward bill was drawn up covering this matter there would be no trouble in getting some one to introduce it.

The ACTING CHAIRMAN. Do you think it wise on the part of the delegates to write Mr. Dillon and ask him to withdraw this bill and substitute a bill by weight?

Mr. STRATTON. I do not know that it would be wise or necessary. I have hesitated to criticize this bill because Mr. Dillon, when he saw this great list of bushels, thought it ought to be uniform. If we are to retain bushels, Mr. Dillon is right, but should we need to take a step further I think Mr. Dillon would agree with that.

Mr. BARNARD. It seems to me that inasmuch as the general trend of opinion seems to be in favor of a weight proposition and the elimination of the bushel that the sooner we take action in that respect, the better it would be for all of us. Why would it not be a good plan at this time to have a proper committee appointed by our president to draft a bill, or make arrangements with some Representative to draft a bill, to promulgate a plan of that kind? If it is in order at this time, I move you that such committee be appointed by our president to go into this matter and take the proper step.

Mr. KELLY. I recall very well that we had a similar discussion here about three years ago, and I believe the conference at that time advocated some such measure, but that was all that seems to have been done about it. I think I would be heartily in favor of the gentleman's motion, of appointing a committee and having a suitable bill drafted, but not only that, when we go to our various homes I think we should do something in the way of arousing sentiment and having some indorsement of the measure from our home town and home legislature, if possible, sending them on here and indorsing such action. If they can get away with it in good shape in California, I think it would be a good thing for all of us. There is more or less dissatisfaction with laws giving weights per bushel. If a sealer certifies a measure, the dealers will fill this measure with some sort of commodity and sell it as a half-peck or a bushel, and when you come to put the amount on a scale you will find there is a variation, since commodities will vary at different places. I am heartily in favor of some action that will eliminate that way of doing business. I second the motion.

The ACTING CHAIRMAN. I would like to ask how many will constitute that committee?

Mr. BARNARD. Leave that to the chairman. I would suggest this, however, that the committee be composed of three.

Mr. FARRELL. I would suggest that the man who is supposed to know more about beans than any other man in the conference should be placed on that committee, for I think we all appreciate Boston beans from one end of this country to the other.

Mr. STRATTON. I thought Mr. Farrell referred to the gentleman from California. California has become the great bean-raising State of this country.

Mr. BARNARD. Mr. Chairman, it seems to me that if this conference goes into this matter with a vim and each State superintendent,

through his various deputies and through the various sealers, city and county, should make an attempt to get in touch with each one of their Representatives and Senators, we would not have any difficulty whatever in getting a bill of that kind put through, because I am satisfied that practically everyone would be tickled to death to get away from the measure proposition, which does not mean anything.

Mr. HANSON. Since Mr. Farrell, from the Empire State, has gone into the subject of beans quite thoroughly, I wish to tell him that Massachusetts and particularly the hub of the universe, Boston, has also gone into the subject of beans quite thoroughly. The State of Massachusetts only a few years ago started the movement of selling all fruits and vegetables by weight only, and the subject of beans was brought up. They have gone into this subject so thoroughly that at the present time we have seven different kinds of beans. That is the way it has been established. We have the common every-day white bean, which is 60 pounds to a bushel; the lima bean, 56 pounds; the shell bean, 28 pounds, and so on. The only bean we have not established is the baked bean.

Mr. JOHNSON. Apart from the comedy I want to recite a condition which actually occurred in California some three weeks ago on the subject of beans. There were four carloads of beans moving from one point to a town where they were to be shipped, and the deputy obtained the weight of the beans at point of origin, and the other deputy at destination was detailed to verify the weight of the first three cars and to place the merchant on his honor on the last car. The average error on the three cars was 26 pounds. On the car which we left to the merchant, who did not know that we had the weight at point of origin, was 2,410 pounds. That is an absolute fact, and the man was prosecuted and paid his fine and will, no doubt, be more observant of laws in the future. We had in California a net-weight clause. We do not sell commodities by gross weight, but deal entirely with the net quantity. When a man sells a certain amount of commodity he must deliver that amount of commodity exclusive of the container. We take off three-fourths of a pound for a container in which beans are packed. The same thing is done in the case of wheat. Most of the California wheat is sold in sacks, and we deduct 12 ounces for every sack. We do business entirely on the net-weight basis in California.

Mr. LINCOLN. I tried a year ago this last fall to arrive at the proper weights per bushel, and after three months experimenting in commodities I found it almost impossible. There is a greater variation in vegetables, according to the size and variety, than in anything else. You will find a considerable difference in the different skinned onions. You will find a great difference between the early and late varieties of apples. You will find a difference in peas. Our State is a great pea-growing State, and I find that there are from 4 to 6 pounds per bushel difference in different varieties of peas. I do not believe we can get a weight-per-bushel law applicable to all these commodities, so I think the conference should go on record against any weight-per-bushel law and require the commodities to be sold by weight.

The SECRETARY. Mr. Chairman, while discussing this question I would like to have the members keep in mind how desirable it is

that we should have uniform shipping containers, and how important it is that we shall have barrels and other containers of a definite size. Is it possible to sell these things by weight; to throw all those baskets out and do business without them? That looks like rather a big question to me. If you talk to commission merchants and people who handle produce, they say it is impossible. We have recognized the exception in the case of berry boxes. Is there not a necessity for other containers of definite size?

Mr. REICHMANN. We have gotten away from the original motion. I think the motion was that certain commodities be sold by weight and a bill be drawn. If we want to go into definite size of containers, then I take it that proposition is for the benefit of the public, but the public will pay in the end. I hope we will stick to the original motion of selling certain commodities only by weight and abolishing the dry measure. Therefore I call for the question.

Mr. HARTIGAN. This committee may fall into the error of reporting at the next conference. But they should send a report of their deliberations to the various members in order that we may have plenty of time in which to consider their recommendations before taking final action next year. If, in the interim, we feel the recommendation as made might be enacted into an organic law in our States, we might take action along that line. If this committee agrees upon some statement by way of a proposed law, we in New York are ready to introduce in our ordinances, if it is not acceptable to the State legislature, a measure which will certify by classification certain commodities to be sold on the weight basis.

Mr. LYTTON. I wonder whether it would be proper for this committee to consider at the same time the question of sizes of packages. Before leaving Iowa our people had a meeting with the produce men in the State. They complained that all sizes of packages of commodities, with or without a statement of weight or measure, with the different standards of measures for different States, were being shipped into Iowa from some of the neighboring States, and were sold in Iowa in the original, unbroken package. It is a hardship on our local produce men to put on a statement of net weight. Would it be out of order for this committee to consider that?

Mr. JOHNSON. I want to state to the delegate from Iowa that if he will kindly advise the State department of California what people ship from California into his State in violation of the container act the condition will be immediately remedied.

The ACTING CHAIRMAN. The question has been called for. All those in favor of the motion made by Mr. Barnard, that a committee of three be appointed by the Chair to get up a suitable bill to regulate the various commodities to be sold by weight, will say "aye," opposed "no." The motion is carried.

Mr. LINCOLN. At the last session of our legislature I met with our Grape Growers' Association. They wanted a little law drawn up, and in looking over the matter I found New York State had one law for grape baskets and Pennsylvania had a different law. The grape growers shipped a great many hundreds of carloads into other States and came into competition with these other State laws. I said, "The only way you can get this matter settled in a satisfactory manner is to get a law passed by Congress regulating the size of the

basket for shipments." They went to Norfolk, Va., and in meeting there with the members of the other States agreed on a bill, which I understood is the bill the secretary just referred to. If Mr. Fischer has any information along that line I would like to have it.

The SECRETARY. As I said in my report, this bill has a great deal of backing, and apparently it has created more talk among the members of the Committee on Coinage, Weights, and Measures than almost any other bill; but, as I have said before, it is very limited in its application. It fixes the dimensions of these Climax boxes, but Climax boxes of any other dimensions may be used, provided they are not of less capacity, and boxes of any other size may be used for grapes or any other commodity without regard to the law, if they are of a different form. The law does not attempt to regulate anything but a certain shaped box, and it does not even do that, because boxes of approximately the same shape but of other dimensions may be used, provided they are not of less capacity. The bill is very defective in its wording.

Mr. LINCOLN. I have found in taking the matter up with these people that they did not want a narrow box. They said the shape of the box made a lot of difference.

The SECRETARY. I might state that the weight proposition and the standard shipping-container proposition seems to be tied up together and you can not separate them. The grape people say it is a physical impossibility to weigh every box of grapes and that they have to have a standard container. Grapes are sold by weight at retail. The same way with the peach people. I imagine they will have a hard proposition on their hands if they try to sell peaches by weight. I would like to have some general mention of the things that should be sold by weight, like potatoes, for example. Potatoes are shipped all over the country in hundreds of thousands of baskets and barrels, and it does not look to me as though it is feasible to mark weight on the individual barrels. Even in California they have a standard box for apples, which is shipped all over the world.

Mr. JOHNSON. Why not leave that to the committee?

Mr. FARRELL. To answer you, in regard to potatoes, we had a peculiar condition in the State of New York. We have Long Island, which is surrounded by salt water, and the potatoes grown on Long Island are small, heavy potatoes; they are filled with water, whereas the potatoes grown in Kings County are a large, mealy potato. The only way we can do is to follow strictly the net-container law and make them mark the weight on each bag of potatoes shipped. We could not have one standard for a container in the State of New York for the Long Island potato against the Catskill potato. You would get four or five potatoes in a quart of Greene County potatoes and you would get a dozen of the Long Island potatoes. How could you measure those by a crate?

Mr. REICHMANN. This committee is simply going to write up a bill; they are not going to have it introduced, but are to refer it to the various members of this conference here in attendance. Of course, there is no question but there are a number of commodities which it is impracticable to sell by weight, and the committee will get this information; they will get replies from the railroad people here, who will readily tell you that certain exceptions will have to

be made in relation to perishable products and in relation to seasonable products, etc., but the gist of all is that we have a definite committee that can get all that information together. They can get all that information from the various interests.

Mr. WATSON. I want to speak a word with relation to the drafting of this measure. I have a great deal of trouble in the size of vegetables sold. Different stores have different sizes of onions and rhubarb and the like, and I wish to say to the committee that they should lay special emphasis on all vegetables, so that there will be no trouble for a sealer to settle this question. All vegetables, I think, should be sold by weight.

ANNOUNCEMENTS.

Mr. HANSON. On behalf of the entertainment committee, I would like to announce that, instead of going to the shad bake at Chesapeake Beach, we have decided to have an informal dinner at the Raleigh Hotel to-morrow evening at 6.30. It will have to be absolutely informal, and the price for this dinner will be just $1. We want at least 50 to attend. We told the manager to prepare at least 50 dinners. The committee desires to take your money for the dinner.

The SECRETARY. I wish to announce that copies of the resolutions passed are ready, and anyone who desires to have a copy may help himself. I am going to call attention to the fact that we have arranged a moving-picture show at the Raleigh Hotel to-morrow evening at 8.15, immediately after the dinner.

Mr. REICHMANN. There is a resolutions committee, and I hope the Chair will announce to those who have resolutions that they should hand them to the resolutions committee, so that they will have time to deliberate on them. I am not on the resolutions committee, but I have been asked about a large number of resolutions that have been floating around.

The ACTING CHAIRMAN. Do I understand you want a committee appointed?

Mr. REICHMANN. No, sir. There is a committee, and I would like to have you announce to the conference that if they have any resolutions to please give them to the resolutions committee.

I have a letter from a gentleman invited to this conference and who, I personally believe, is one of the best weights and measures men in the United States. I refer to Richard Mommers, the man who has charge of all of the weighing of the American Sugar Refinery. Mr. Mommers expected to be here, and he found at the last minute, he could not come, and he wanted me to express to the secretary his regret of being unable to attend, Mr. Fischer having sent him an invitation.

The SECRETARY. Mr. Chairman, as there is nothing else on the program for to-day, I move you that we adjourn.

The motion was seconded and agreed to.

(Thereupon, at 1 o'clock p. m., the conference adjourned to meet at 10 o'clock a. m. Thursday, May 25, 1916.)

FOURTH SESSION (MORNING OF THURSDAY, MAY 25, 1916).

The conference reassembled at 10 o'clock a. m.
Dr. S. W. Stratton assumed the chair.

REMARKS BY MANUFACTURERS OF WEIGHTS AND MEASURES AND WEIGHING AND MEASURING DEVICES.

The CHAIRMAN. Gentlemen of the conference, we come this morning to one of the most interesting parts of our program. Personally, I have looked forward to the day when we might get together with the manufacturers and discuss matters with them, pro and con. Unfortunately in the early days there were many controversies, not so much about the pros and cons, but more in regard to the politics of weighing and measuring apparatus. In those controversies we are not at all interested and we did everything we could to discourage them. That kind of discussion has largely passed away. The bureau has many conferences here during the year in many different fields, and the very first thing that is done in these conferences is to welcome typical users of an article and typical manufacturers who confer together with the laboratory men, and in that way we always get the best results.

One of the very greatest incentives that we can have in this country toward the improvement of weighing and measuring devices is for this conference once a year to express itself along the line of the things they have found, good or bad. If you, as inspectors, have found weighing and measuring apparatus faulty or defective, this is the time to say so. Every reputable manufacturer will welcome that sort of thing, as he wants to know what the requirements are. In the past we have met manufacturers of weighing apparatus who would say, "We know all those things, and we do not want to be told of anything of that kind; we want the bureau to do just so and so; just approve of what has been done."

This is not a bureau matter at all, but it is the usual way in which the results of practice are put into effect, and, as I said before, nothing could be of greater value in the improvement of the weighing and measuring devices than to bring together once a year the people who make them and the people who use them. It is in these frank face-to-face talks that such things are brought out and technicalities are laid aside and we get at the truth of things. Therefore I personally welcome the bringing of the manufacturers into this meeting in a technical way, and in that you will always find the heartiest cooperation on the part of the bureau and, I am sure, on the part of the sealers.

The SECRETARY. Up to the present time we have had requests to speak from the Peerless Scale Co., the E. & T. Fairbanks Co., the

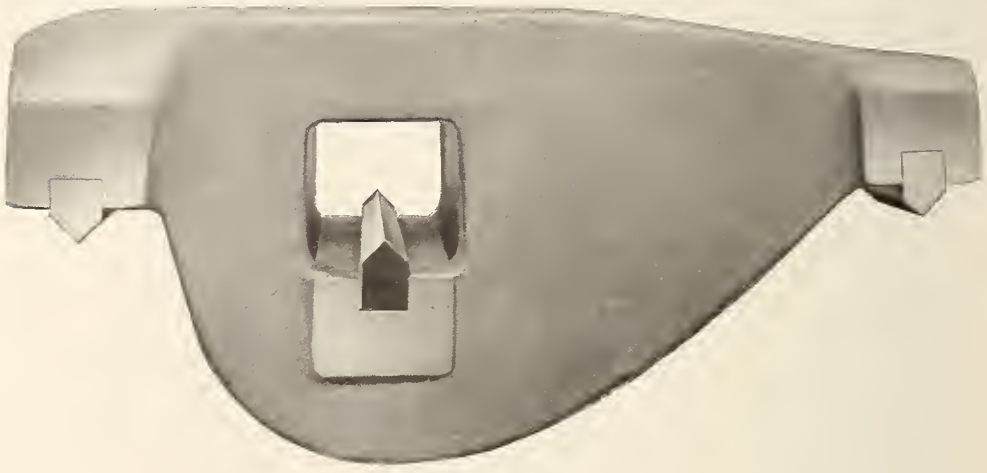

FIG. 2.—Main lever.

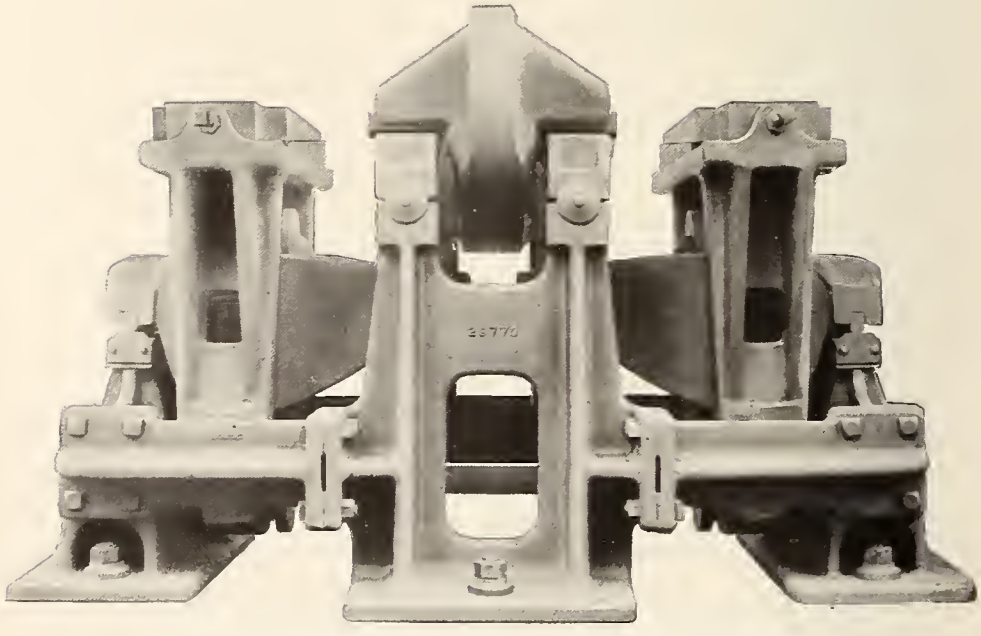

FIG. 4.—Construction of lever stands and method of connecting them.

Scott Paper Co., Neidlinger Bros., the Toledo Scale Co., the Measuregraph Co., the Pelouze Manufacturing Co., and the Chatillon Co. Perhaps I have omitted one or two others; but if I have I would be glad to have them speak out and have their names added to the list.

The CHAIRMAN. Before I forget it I want to ask that the new members this year do not fail to visit the laboratories of the bureau, even though you have to leave the meeting. The men in Mr. Fischer's section will be glad to show you about, either in groups or singly. Do not let these meetings keep you from an inspection of the weights and measures section, and also the other sections. A number here perhaps have not seen the large testing machines, and before you leave we will arrange a test on the large machines.

The SECRETARY. If we divide this meeting into 10 parts, that will leave 15 minutes for each manufacturer. That is not very much time, but I do not think some will speak more than just a few minutes.

RECENT DEVELOPMENT IN HEAVY TRACK-SCALE CONSTRUCTION, BY A. BOUSFIELD, CHIEF ENGINEER E. & T. FAIRBANKS AND CO.

Mr. BOUSFIELD. Mr. Chairman and gentlemen of the conference, those of us who have been intimately associated with track-scale construction for the past few years have been intensely gratified to see the great advance that has been made in design, in installation, and in maintenance. These conditions are due to quite a number of contributory causes. The control of track scales to-day is largely in the hands of the engineering departments of the railroads and the large industrial corporations. The special committee of the American Railway Association have done good work in an advisory capacity, and the tests conducted by the Bureau of Standards have also excited an interest throughout the country in this important subject. We have to-day a few slides illustrating the recent construction, which it is hoped may be of interest to the delegates and the guests.

The New York Central Railroad Co. have recently installed at West Albany, N. Y., a track scale which is undoubtedly the largest in the world. The scale is 100 feet in length, and is built with rigid deck construction, and provision is made for 5-foot protective overlap at each end, thus making a 90-foot weighing rail. The scale is built in six sections, and each section is designed for a concentrated load of 275,000 pounds. The secondary or extension levers are designed to be of sufficient strength to transmit this load of 275,000 pounds applied at each section simultaneously to the fifth lever and thence to the weighing beam, so that the lever system is capable of sustaining a load of 275,000 pounds multiplied by 6, or 1,650,000 pounds.

The question naturally arises why such very heavy theoretical loads should be assumed in the design of the scale. The management and the engineering staff of the New York Central Railroad Co. desired a scale of sufficient length and capacity to weigh the largest locomotive or car built at the present time or that is likely to be built for many years to come. It was felt that the scale should furnish a reliable and accurate means for the quick determination

of weights for all classes of heavy locomotives and cars. A weighing capacity of 275 tons was therefore decided upon, and after a series of investigations concerning the reactions encountered when the largest type of existing locomotive was considered on the weighing rail, it was decided by the New York Central engineering staff to have the scale designed for a theoretical load of 275,000 pounds—i. e., one-half of the weighing capacity per section—and that the load should be considered as acting simultaneously on all the sections. It was decided that with the above-mentioned loading the limiting stresses recommended by the American Railway Association specifi-

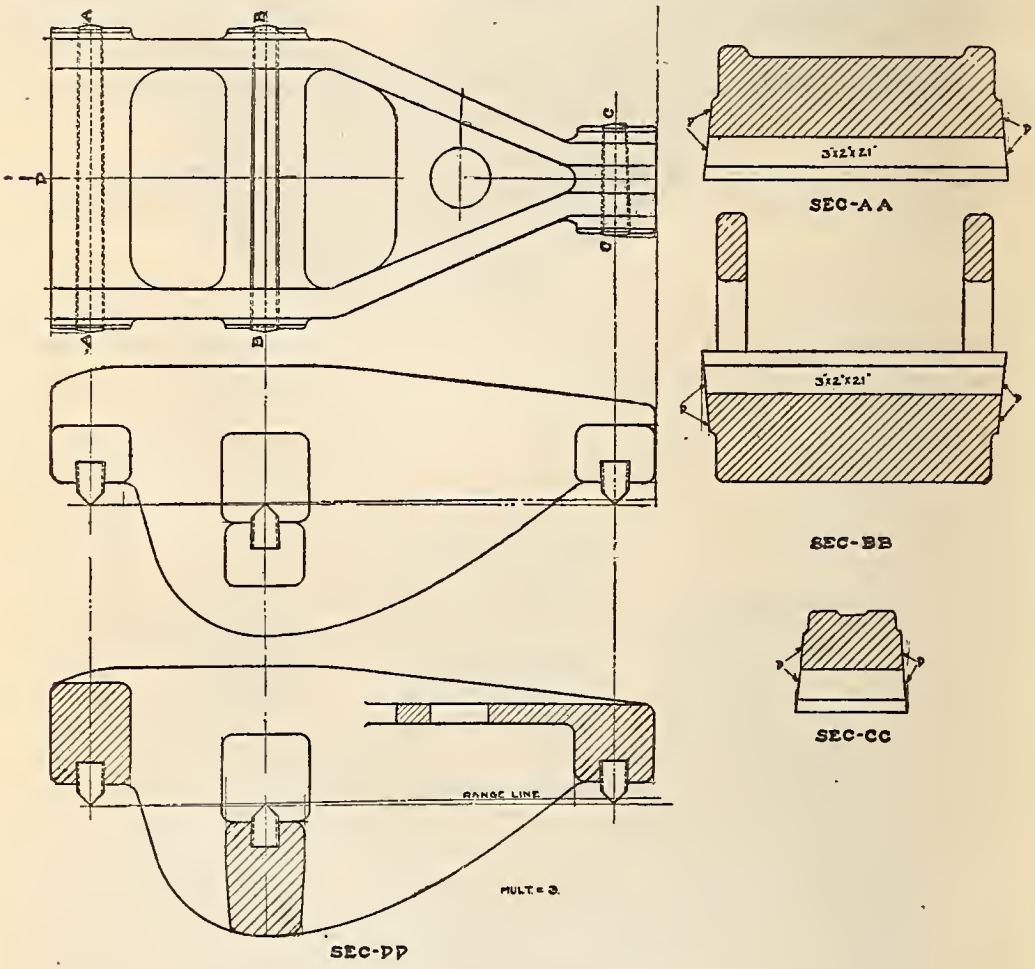

FIG. 1.—Detail of main lever.

cations for track scales should be adopted and also that the bearing pressure of 7,000 pounds per linear inch of knife-edge recommended by the American Railway Association specifications should not be exceeded.

The scale was designed and built by E. & T. Fairbanks and Co. at their factory at St. Johnsbury, Vt., and was assembled complete in the erecting shop before shipment.

In considering the heavy concentrated load of 275,000 pounds per section, or 137,500 pounds per main lever, the problem at once pre-

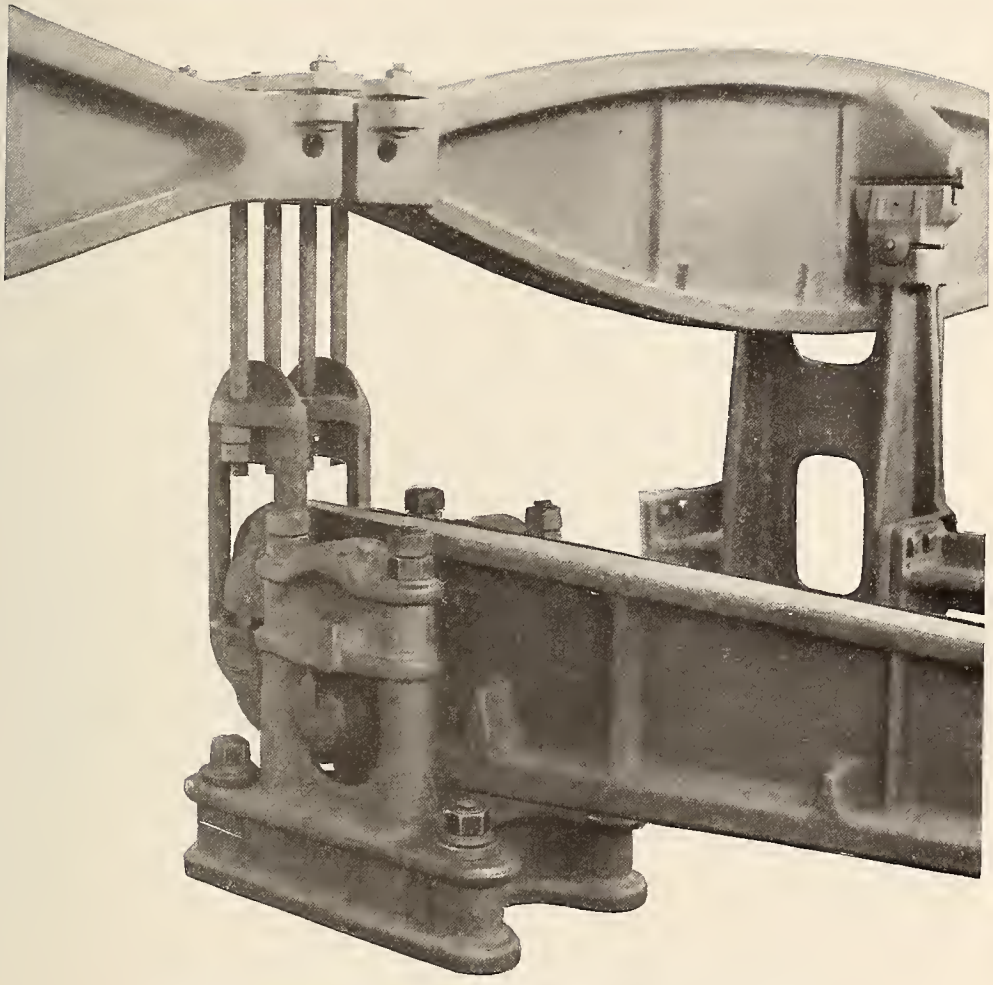

FIG. 5.—Connection between middle extension levers and fifth lever.

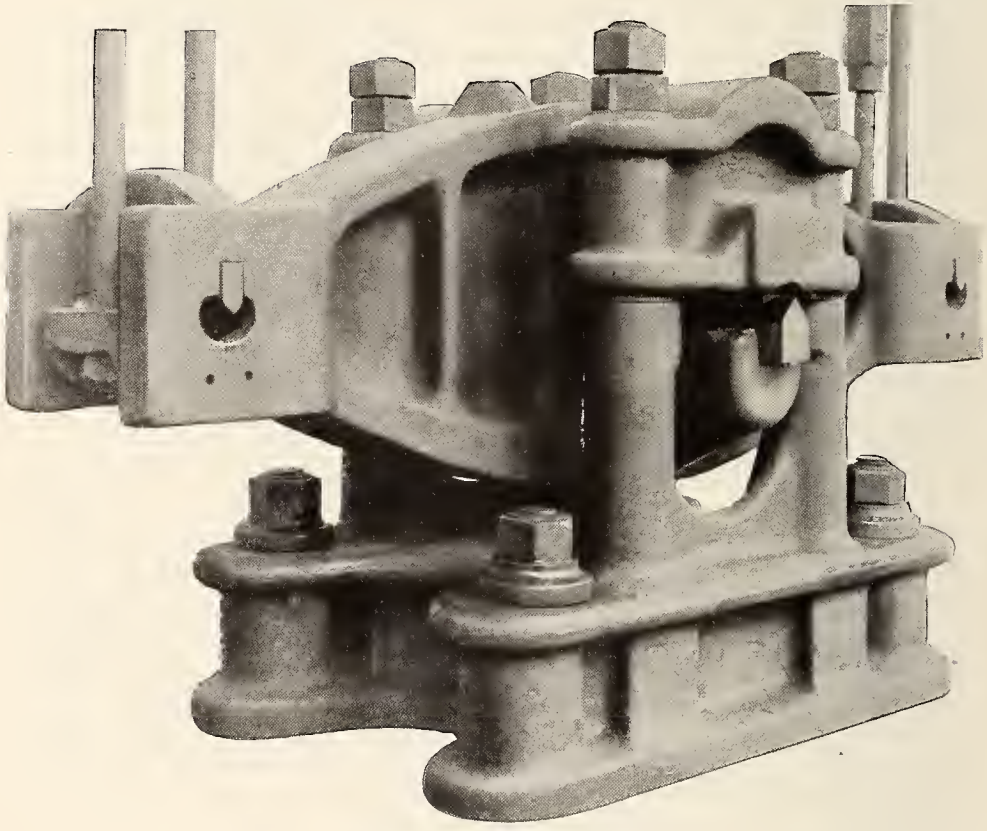

FIG. 6.—Short even lever.

sented itself of producing a knife-edge in the main levers of sufficient length to reduce the load per linear inch below 7,000 pounds and to properly support it so as to insure an equal distribution of the load throughout its length without undue deflection. The design heretofore used of a single-web lever with projecting hubs on either side for the support of the pivots was abandoned and a double-web construction adopted. Figure 1 shows a detail drawing of the lever and figure 2 is a photograph with the pivots in place. It will be noted that with the double-web construction connected by heavy transverse sections over and under the knife-edge a very rigid and efficient support is obtained throughout the full length of the knife-edge. The load and fulcrum knife-edges in the main lever

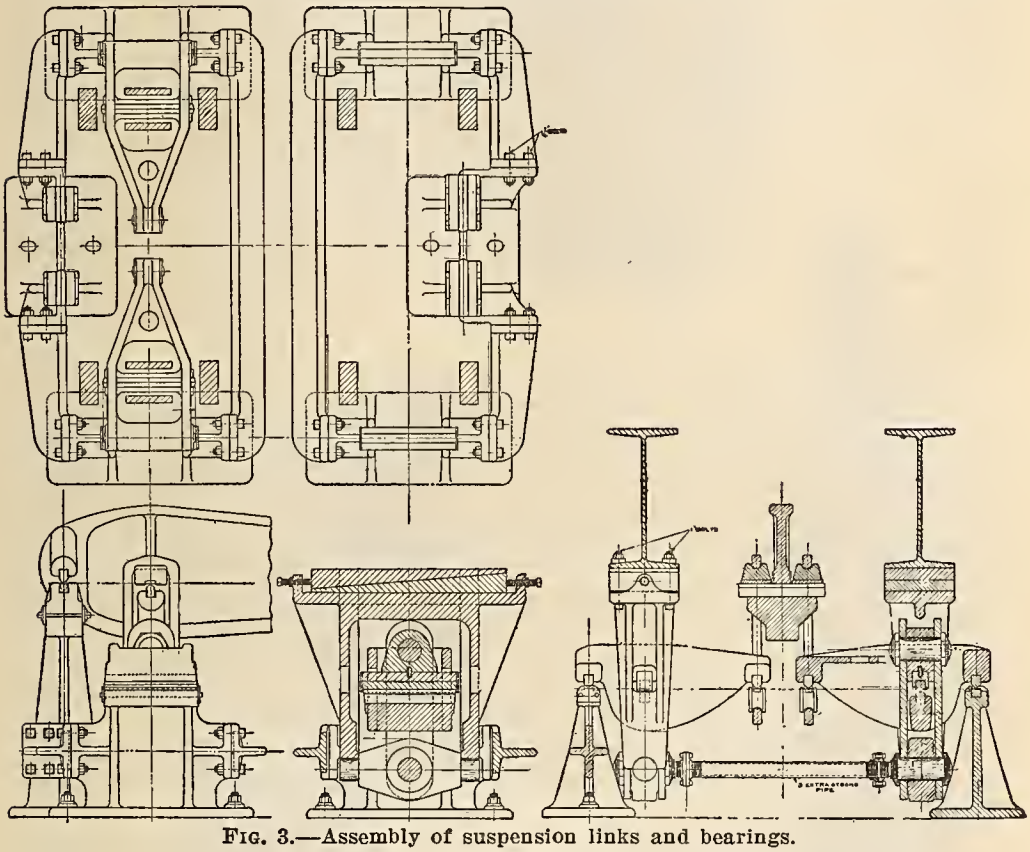

FIG. 3.—Assembly of suspension links and bearings.

are 21 inches long, and they are truly machined and ground to fit into machined recesses in the lever.

The main levers are made of cast steel and weigh, finished, 906 pounds each. In order to effect a true suspension for the load imposed upon the main levers, bridge eyebars 10 inches by 1½ inches were used. These eyebars engage with 5-inch-diameter pins above and below the main load knife-edge. Figure 3 shows the assembly drawing of the suspension links and bearings. The main bearing block above the knife-edge is bored for the reception of the 5-inch pin, and is recessed at the lower edge for engagement with the bearing which extends throughout the full length of the knife-edge and carries the hardened bearing steel for engagment with the knife-edge. The lower pin engages with a crossbar designed with trunnion ends,

which in turn supports the main bearing to which the longitudinal girders are attached. With this construction the heavy loads are transmitted through the true theoretical center lines and an efficient and flexible suspension is obtained.

To preserve the true relative position of the main lever stands with the end and middle extension lever stands, and to insure stability, a system of transverse bracing is used. This bracing consists of heavy T-section members securely attached by flange connections to the lever stands. This connection is clearly shown in figure 4.

The end and middle extension levers are designed with knife-edges of sufficient length to reduce the bearing pressure per linear inch below 7,000 pounds when a theoretical concentrated load of 275,000 pounds is considered as acting simultaneously at each section. This necessitated a bearing surface for the fulcrum knife-edges of the middle extension levers of 25 inches, or $12\frac{1}{2}$ inches on each side of the lever, and to insure an even distribution of the load over this length of knife-edge, a special compensating bearing was designed for both end and middle extension lever stands. This bearing may be seen in figure 4. It is constructed with a spool engaging with curved surfaces of slightly greater radius than the spool in both the stand and the bearing block carrying the steel for engagement with the knife-edge. With this construction a full line contact is insured for the long knife-edge.

The connection between the middle extension levers and the fifth lever is shown in figure 5, and is accomplished by two cast-steel loops, encircling a continuous saddle block which engages with the butt pivot of the fifth lever and is connected by bolts with the saddle block engaging with the end pivots of the middle extension levers. As the scale is built in six sections, and two middle extension levers are used on each side of the transverse center line, it is necessary to provide efficient means for connecting them, and this is accomplished with a short even lever shown in figure 6.

This lever is supported by a massive stand fitted with removable caps and designed to resist the upward thrust due to the transmission of the load from one extension lever to the other. Compensating bearings are provided for this lever at all knife-edges. The same design of stand is used for the fulcrum bearing of the fifth lever.

The weighing beam is of the well-known Fairbanks type registering form and is made of high-grade, close-grained cast iron, fitted with a steel insert for the main notches. The beam is 350,000 pounds capacity, and it is fitted with 200,000 pounds auxiliary registering weight, thus giving a total weighing capacity of 550,000 pounds.

Figure 7 shows half the scale set up in the factory erecting shop and figure 8 shows the detail of the middle extension lever.

Great care was exercised in both the design and manufacture of all the levers to provide for an even distribution of metal about the pivot line, and all pivots are located practically on the neutral axis of the section. All nose irons were machined and fitted with the greatest care so as to preserve parallelism of the knife edges, which is very necessary when they are of such great length.

The material used for pivots and bearing steels throughout the scale was high-grade chromium-vanadium alloy steel, with a tensile

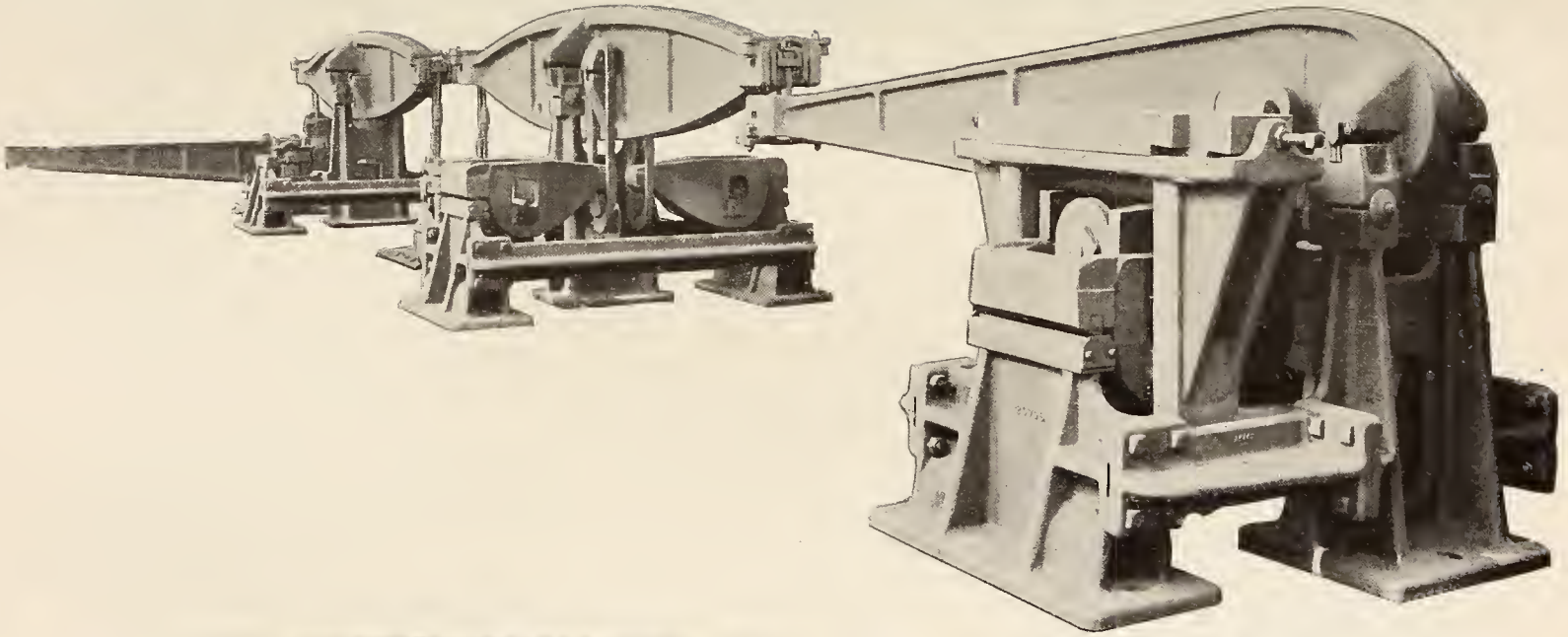

FIG. 7.—View of half scale set up at factory.

FIG. 8.—Middle extension lever.

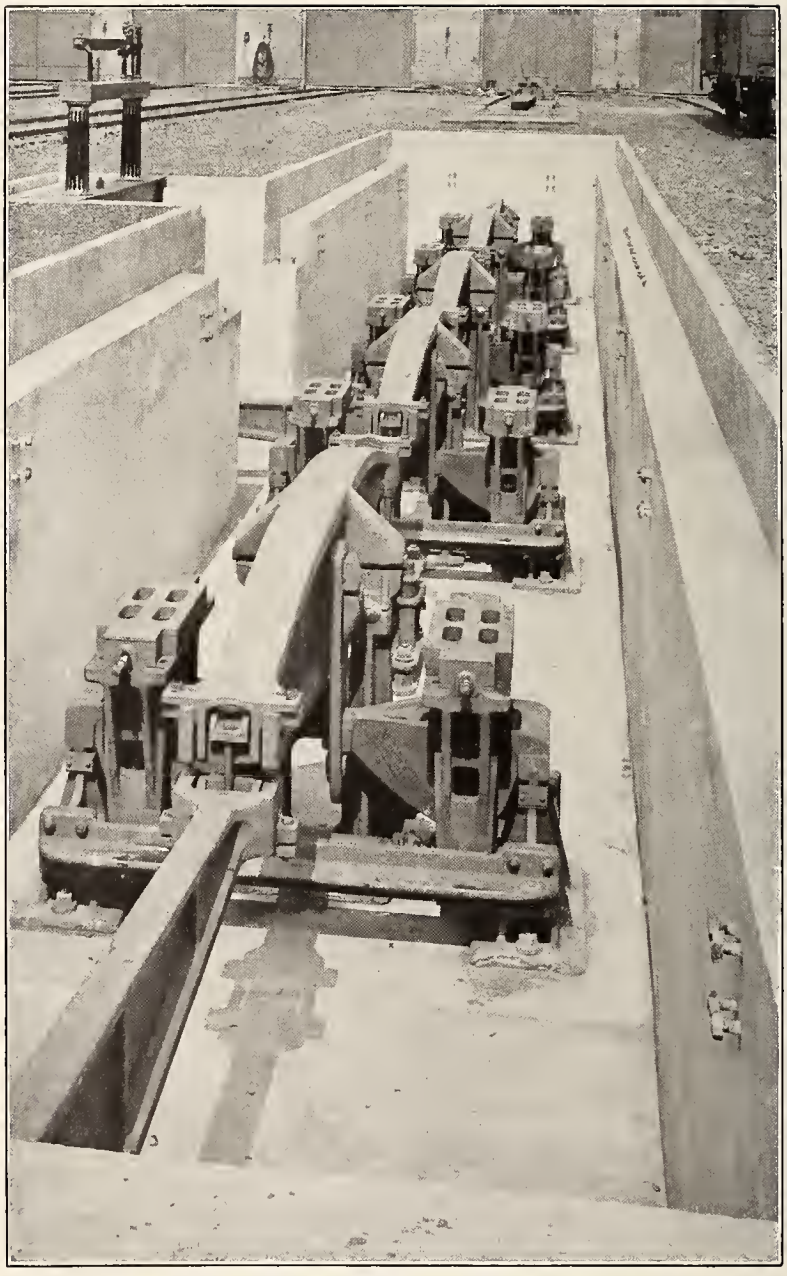

FIG. 9.—Scale mounted in pit ready for superstructure.

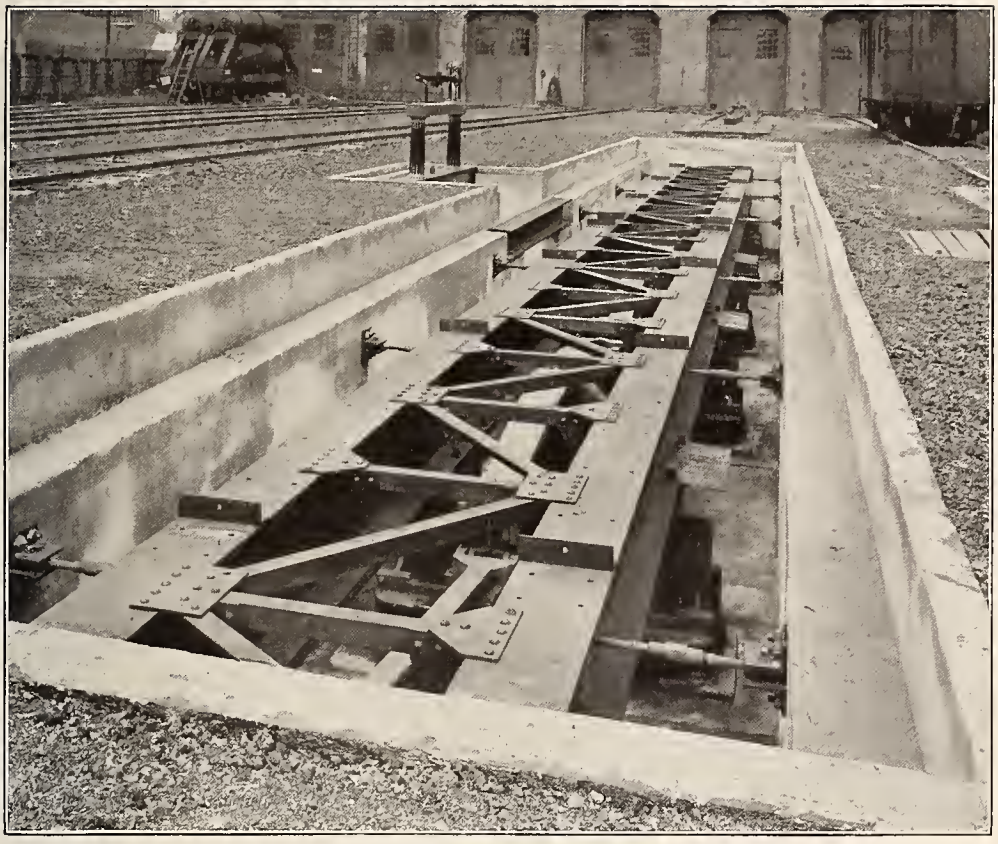

FIG. 10.—Scale bridge in position.

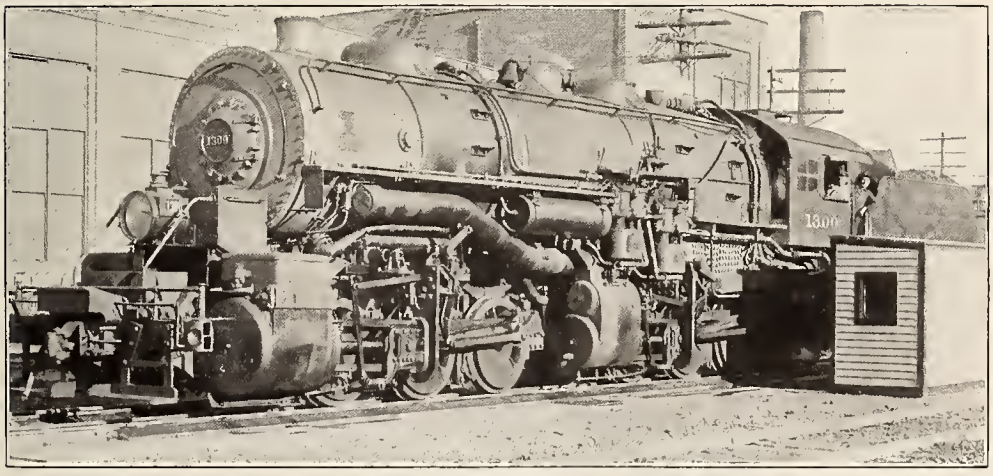

FIG. 11.—Locomotive and tender being weighed on scale.

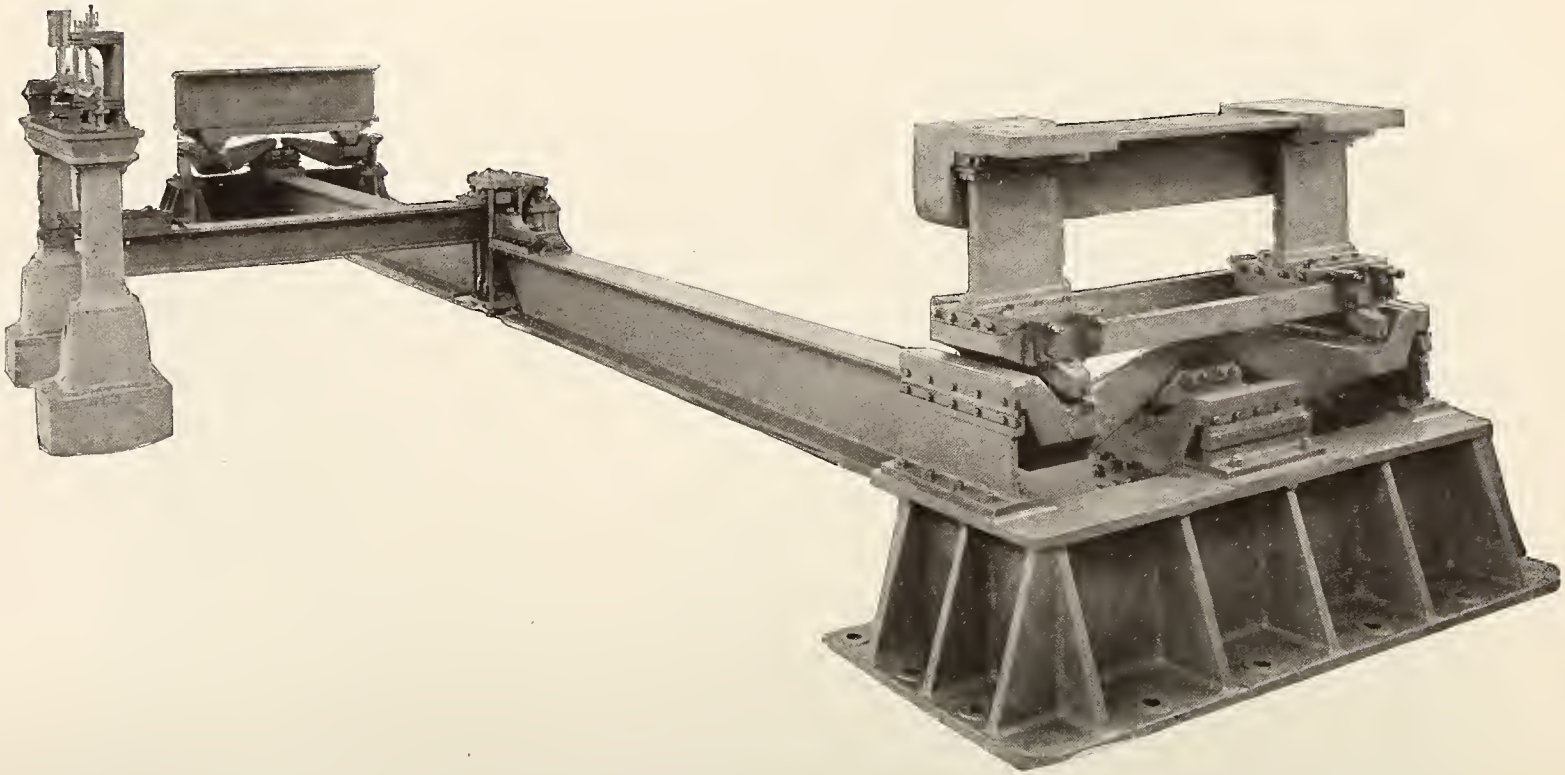

FIG. 12.—View of plate fulcrum scale.

strength of 200,000 pounds per square inch, and was hardened in oil. With this grade of steel very little trouble was experienced in keeping the long knife-edges straight, and consequently very little grinding was necessary after the pivots and bearings were hardened.

The following table gives the details of the lever system:

Description.	Length.	Number used.	Weight of each.	Material.	Multiplication.
	Ft. in.		*Pounds.*		
Main lever	3 0	12	906	Steel casting	3
End extension	12 6	2	3,160	Cast iron	8
Middle extension	15 9	4	6,465	do	8
Even lever	4 3	2	985	do	
Fifth lever	10 6	1	1,925	do	8⅓

It will be noted that the lever system is arranged to give a multiplication of 200 at the tip end of the fifth lever. A shelf lever with a multiplication of 4 is used, thus giving a multiplication of 800 at the butt of the weighing beam.

The main girders are composed of 30-inch 200 pounds per foot girder beams, and the transverse beams supporting the dead rail are 15-inch 140 pounds per foot girder beams. The deck is composed of two thicknesses of 1¾-inch planking with a layer of tarred paper between.

The foundation is built of concrete reinforced by two layers of ⅞-inch rods spaced 6 inches apart. These layers begin 6 inches from the bottom of the foundation and extend to within 6 inches of the top. The pit is 8 feet 11 inches deep from the base of the lever stands to the base of the weighing rail.

The total weight of the scale completely installed is about 300,000 pounds.

Figure 9 shows the levers and stands mounted in the pit ready to receive the superstructure.

Figure 10 shows the bridge in position.

Figure 11 shows a large locomotive and tender, New York Central class 1,300, being weighed on the scale. The locomotive and tender in full running order weigh 518,240 pounds.

After installation at West Albany, the scale was formally tested in the presence of the New York Central and Fairbanks officials with two test cars of the Fairbanks type, weighing, respectively, 80,000 pounds and 60,500 pounds. Each section was tested separately with each of the cars and a variation of less than 10 pounds was established by the results. The same degree of accuracy was attained when both cars were used, giving a test load of 140,500 pounds, and the sensibility reciprocal was 20 pounds.

Plate-fulcrum track scale.—The need for a track scale which will meet the weighing conditions on a busy railroad and maintain its accuracy and sensitiveness for a long period of years without repairs having to be made, has led to the development of the plate-fulcrum type, wherein knife-edges are entirely eliminated and the loads are carried by thin plates of steel. With this construction the vital parts of the scale are not worn by use, hence a means is provided for retaining the accuracy of the scale almost indefinitely.

Figure 12 shows a plate-fulcrum track scale recently developed for the Pennsylvania Railroad. This scale has a weighing rail 52 feet in length, and in order to eliminate complications the scale is built in two sections. The supports for the main levers and the longitudinal extension levers are formed by means of massive base plates which will be securely anchored to the concrete foundation.

In designing the scale a load of 400,000 pounds is considered concentrated at each section, and the plate fulcrums throughout the scale are designed to successfully withstand this load for an indefinite period. The load from the main girders is transmitted to the plate fulcrums through massive bearing blocks engaging with the upper portion. These bearing blocks are securely tied together by means of transverse bracing so that the load is transmitted through true vertical center lines. Where the end-extension levers connect to the transverse extension lever a refined construction is adopted so as to make provision for expansion and contraction of the longitudinal extension levers. Figure 13 illustrates this construction.

The lower portion of the struts engaging with the plate fulcrums in the tips of the longitudinal extension levers is ground to a radius and engages with a hardened steel plate, thus providing freedom of action without disturbance of the transverse extension lever when expansion or contraction takes place. The transverse extension lever is directly connected to the weighing beam.

Figure 14 illustrates the beam outfit. Metal bases, pillars, and shelf are used, and a means is provided for transverse adjustment so as to maintain the connection from the tip of transverse extension lever to the butt of the beam in a vertical position when the nose iron of the transverse extension lever is moved. The beam is graduated to 300,000 pounds by 50 pounds, and an auxiliary weight of 100,000 pounds capacity is provided, thus giving a total weighing capacity for the scale of 400,000 pounds. An indicator moving over a graduated arc is also provided, thus furnishing a very accurate means for balancing the beam. The main poise is provided with ball bearings so as to eliminate friction to as great an extent as possible.

The plate-fulcrum track scale has been developed jointly by E. & T. Fairbanks & Co., A. H. Emery, and the Pennsylvania Railroad, and this type of construction for track scales has now been adopted as a standard by the Pennsylvania Railroad Co.

DISCUSSION.

The CHAIRMAN. This paper has a peculiar interest to me. I have felt for many years that a plate fulcrum would entirely supersede the knife-edge. There is no reason whatever why this plate fulcrum should not be used in the most delicate balances. I wonder why it has not been used in this way long ago. You people realize the small amount of displacement; those plates could be made an inch thick and they would not affect the sensibility very much. There is very little movement there, and I am very glad indeed to see that principle being introduced, and before long it will extend down to the simplest balances.

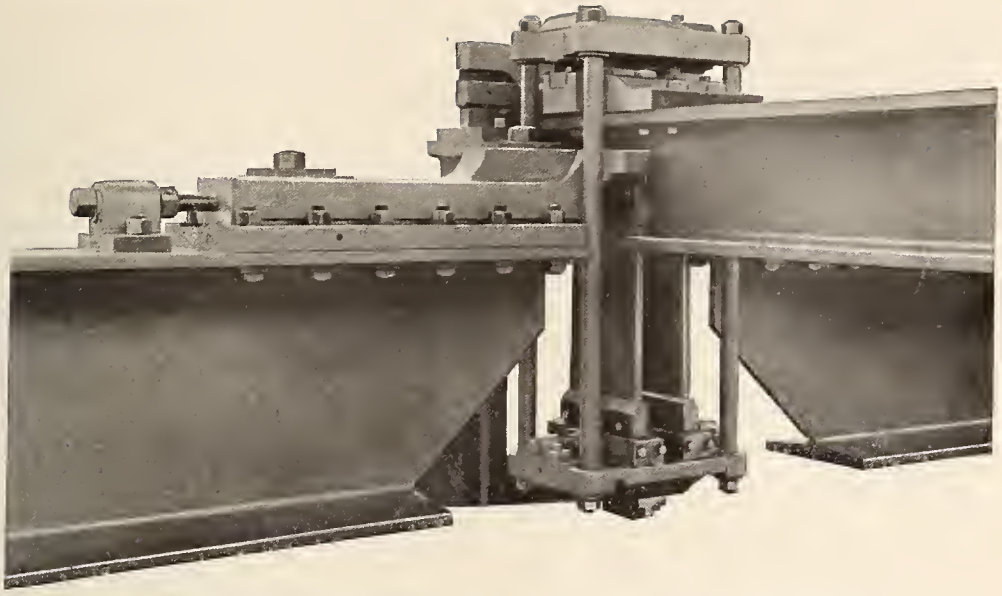

FIG. 13.—Connection between end extension lever and transverse extension levers.

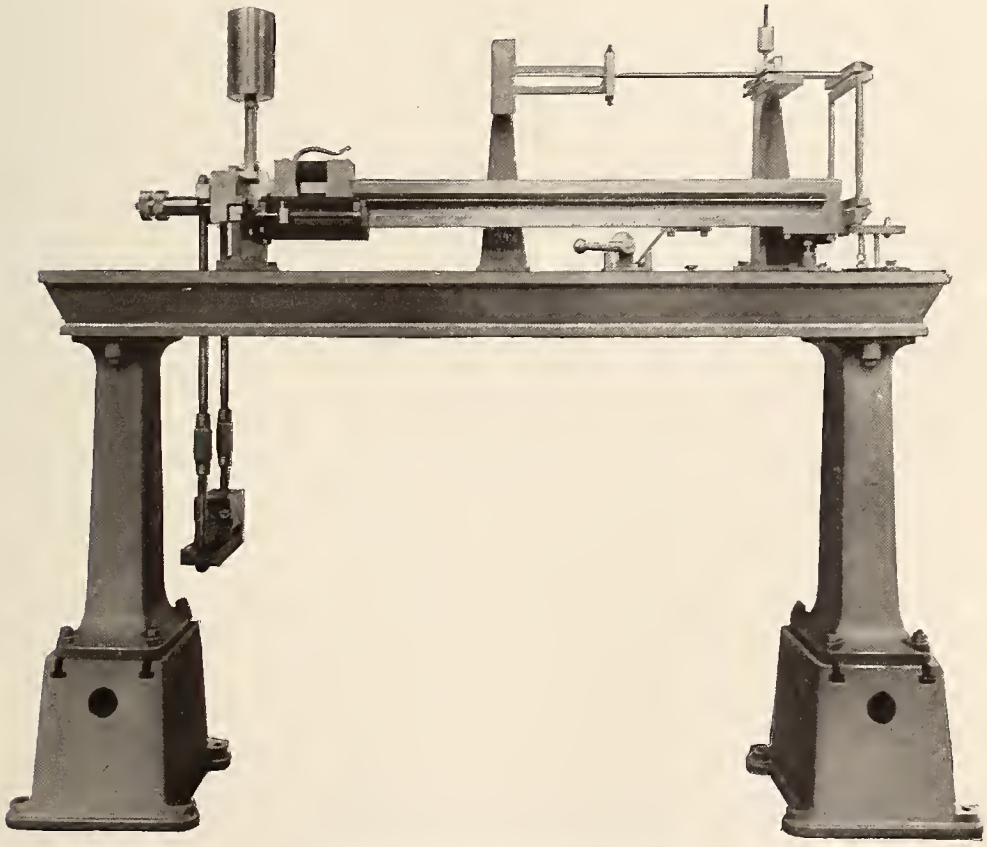

FIG. 14.—Beam of plate fulcrum scale.

REMARKS BY EMANUEL BLOCH, GENERAL EASTERN AGENT, PEERLESS WEIGHING MACHINE CO.

Mr. Bloch. Mr. Chairman and gentlemen of the conference, few of you have ever paid much attention to a kind of scale that lately has been in such great use that millions of dollars are now invested with the amount increasing yearly. I mean to speak of the automatic coin-controlled weighing machine.

Like all other things, this industry is entering into the progressive path, and after many trials, losses, and failures seems to be making headway and coming into its own.

Not many years ago when anyone was ordered by his doctor to keep tab on his weight he had to go to the feed store or butcher shop to get weighed. Since then all sorts of scales have been manufactured and placed in convenient locations for the use of the public.

Drawbacks were so great that hardly any manufacturer of such scales could ever get a fair return on his investment. The main reason for this is that the public had no confidence in such weighing machines of unreliable and inaccurate construction, which were affected by the heat, cold, dampness, and age.

I am representing here a concern—the Peerless Weighing Machine Co., of Detroit, Mich.—which at great cost and great pains has evolved a weighing machine that stands alone for perfection over all other coin-controlled scales.

The difficulty is the mass of the public is not educated to note the differences between a good reliable beam scale and the unreliable scales of the old types, which at best can not correctly weigh small loads.

Last year it was my privilege to visit the exhibition of weights and measures at Philadelphia, and it is unbelievable that scales and measures as exhibited there to cheat people could possibly exist in such an enlightened country as ours.

What does this show? It shows simply how little educated are the masses of the people in regard to the weights and measures.

Why not do something practical to educate them? It is your province, gentlemen, to do something to this effect. I have been thinking over these matters a great deal and have brought before the directors of the Peerless Weighing Machine Co., of Detroit, a proposition which in my judgment would start something in the right direction. I have proposed that upon recommendation of the weight and measure people of any city in the United States our company place one or several of our beam scales in locations accessible to the public, such as city halls, county courts, public markets, post offices, railroad stations, etc., such scales to weigh free up to, say 30 pounds, so that anybody making a purchase of any commodity may check the weight of the goods which he pays for.

We know that most merchants are honest, but among them are some black sheep, if we may believe the Philadelphia exhibit which I mentioned before.

But it would be a satisfaction to the honest merchant if he knew that his customer checked his purchases and found them correct. It would keep in line the dishonest merchant and do away with unfair competition.

Little by little the public gets accustomed to weights and acquires the proper education, and this will do more to eradicate false weights than all the penalties that could be imposed on wrongdoers.

Our Peerless beam scale is a very expensive, well-constructed machine, and business can not be done, as per my proposition, entirely gratis. I propose that any weight above 30 pounds will be charged 1 cent for the use of the scale. This would only be a fair return to the Peerless Weighing Machine Co. for the large outlay and the expense of keeping the machine at all times in order. There will not be any expense to any town or city. All we would ask would be a fair protection by the local police so that our scales in public places be not tampered with.

Any of the gentlemen present may at his leisure get all the information from our main office at Detroit, or from our Philadelphia office, of which I have charge. Many of our beam scales are in use in Washington and can be seen here, as well as anywhere in the United States. They are giving perfect satisfaction everywhere.

I would call especially to the attention of the gentlemen present the high perfection of the pivots used in this scale, which makes them sensitive in the extreme. The beams are graduated to 300 pounds by 4 ounces and are very sensitive. The platform rests on eight pivots and loops, double the number used in most platform scales, which insures proper and correct weight no matter in what position the load stands upon it.

Further, I wish to touch upon another subject, and that is, if there is any article on earth that should not be taxed by towns, counties, and States, it is a scale; and yet some States do tax them out of business, for the sole reason that a penny is necessary to operate them. Don't you think that a scale that weighs free up to 30 pounds should be free of tax, in order to give the public the benefit of its use?

I know this does not come under the supervision of the bureau of weights and measures, but as the proceedings taking place here are reported all over, I want simply to call the attention of fair-minded people to it.

I can say this, that the only losers through the tax are the States, cities, and towns, as I know one instance when a scale company intended to place 1,000 scales in a certain State, and when it was learned that the cities required a tax, the county another, the State a third one, and the tax collector wanted as much fee as the three taxes together, naturally it was decided not to enter the field. Result, 1,000 scales not manufactured. Losers, the workingman, the railroad, the transfer men, the collectors not getting positions to collect from them, the hotels, where such collectors would stop, etc., ad infinitum. For a few miserable dollars that a city may collect from such a tax hundreds of people can not make their livelihood.

I think progressive manufacturers, such as the Peerless Weighing Machine Co., of Detroit, should be encouraged, and I will say that we court any suggestion from you weight and measure people in order to serve well the public, which is our aim. I hope I have not presumed on your attention too long. I wish to thank you for it.

DISCUSSION.

Mr. EGAN. Is it your idea that manufacturers of these scales can place them around throughout the country without any kind of super-

vision except what you see fit to supply yourselves, or without their being subject to inspection by sealers of weights and measures?

Mr. BLOCH. We always want to have our scales under the rules of this bureau and we welcome that.

Mr. EGAN. I do not know what particular scale you are interested in or manufacturing, but I notice that in our territory there are a great many coin scales to give personal weight, and that it is pretty difficult to trace any ownership in or management of and responsibility for them. I know that upon one occasion I wrote to a firm in New York regarding their scales that were a wreck. I received no reply. They are put into a store, but the storekeeper disclaims any responsibility and the railroad agent disclaims any responsibility, and therefore I am curious to know about that.

Mr. BLOCH. I suggest the responsibility rests on the man who operates the scale. We stand back of our trade. We manufacture this scale you have been asking about. I would welcome the sealers to seal our scales. But the facility of this scale is that everything is open; the sealer can get to it without asking us. There are some scales that you need a key to open. This does not. This scale is absolutely open and the sealer can get to it.

The CHAIRMAN. I do not imagine you would object to any of the local conditions, but the tax you do object to?

Mr. BLOCH. I would be willing to stand a little tax, but when it is overtaxed and the fee man wants more money than all the taxes, I think it is a hardship. People do not consider that we have a good many things to contend with. Some people say that in a scale like this when a person puts a penny in the scale they are willing to lose it when the scale is out of order. There are many scales that do get out of order. I am not responsible for those scales. We attend to our scales, and it is not my province to talk about my competitor's goods. I blow my own horn and I do not knock. I say this, that wherever we have scales we guarantee the man who operates it. We place the scales inside of stores, where people are independent, and anyone who claims he loses his penny can get it immediately. It happens every day that I find nickels, silver, and gold pieces in our scales, and not in one instance have I ever taken a nickel or a dime or a gold piece, but I always give it to the merchant, because when a claim is made it is made to the merchant and not to us, and he should be made to feel that if a customer of his has lost a $5 gold piece he can get it back. Some persons drop in a $5 gold piece, and if a collector is not around the merchant can take his name and hand it to him. We keep the slugs, for the merchant has no responsibility, and we get just as many slugs as we get dimes. There are other drawbacks that mar the profits to the company, and these are under the different laws of the States. In Pennsylvania when scales are sold on a distress warrant of the landlord there is no redress. It happens often that there are lots of profits taken away. It is not the scale men in general who make a million every day.

Mr. BARNARD. We have a number of this manufacturer's scales in the city of Battle Creek, and also a number of others of the same type. I find the merchant has no way of opening the scale in order that he may test it, and I am wondering and would like to ask this gentleman what provision his company makes for testing these scales. Our city ordinance does not provide funds for putting pen-

nies in the scales to test them, and unless some provision is made for testing we will tie them up.

Mr. BLOCH. If you desire I will take the matter up and send you the key. Any sealer in the country can have a key to open our scales and control the mechanism. The mechanism that controls the sealing of the scale is not under lock. On the side there is a little break which you can open and turn a screw and you have the whole mechanism in view. If you want the key to the mechanism that controls only the penny slot, you can have it. I will make it a point in my territory—I control seven States—to try to get into communication with you and send the keys without even a demand for them. Battle Creek, Mich., is very near Detroit, and I had somebody from Detroit see me and I gave him the key. Those are petty things we can not always fix immediately.

This business is just as responsible as any other business in the world, and we try hard to make a living. Nothing is perfect, but we try to achieve perfection. We gain experience and new knowledge every day and try to do the right thing. We do not want our scales to be looked upon as a penny-catch affair. They are not, but they are strict business. We do not appropriate 1 cent from any customer who loses a penny from our scales. Naturally, if you address yourself to a porter you would not get any response, but if you go to any proprietor of a store I do not think I have a customer who would refuse to refund.

Mr. JOHNSON. Would it not be well to keep in mind that this weighing apparatus is not a commercial weighing machine; it does not enter into the avenue of trade, but is somewhat of a novelty proposition. I presume that is the attitude of the conference toward that particular type, since you do not describe any specifications by which it shall be built or any tolerances.

The CHAIRMAN. We have not taken any definite attitude, but I still question whether you would like to have any scale in your district that the public uses, coming and going, taking their own weight, that is not correct. I have often been annoyed by scales that are not correct, and it is proverbial that they are not correct. It brings up my question, If they are to be allowed, should they not be required to be correct or reasonably so?

Mr. JOHNSON. My point is that there is nothing bought or sold by the apparatus. It is of little difference to you whether you weigh 180 pounds or 182 pounds. It is simply a public convenience and more of a novelty proposition.

The CHAIRMAN. Should we always look at these things from a standpoint of dollars and cents? I am just as much concerned in knowing my weight correctly as I am my purchases.

Mr. BARNARD. I would like to take issue with the gentleman from California in that respect. In our city we have several sanitariums and a great many patients are going there every year for treatment. I would like to inform Mr. Johnson that 2 pounds means more to some of those patients than $100, and when they get on one of those scales that is not correct and find they gained 2 pounds in their imagination and afterwards found out that the scale was not correct, they would soon make up their minds that something should be done with that sort of a scale. Consequently, I have examined them

very carefully, and when I found one that was not correct I tagged it, and if it is not taken care of in 10 days I take it down to the office. It is not very long before some one comes to make it correct.

REMARKS BY ALBERT H. MEADS, ATTORNEY FOR THE TOLEDO COMPUTING SCALE CO.

Mr. Chairman and gentlemen, the Toledo Scale Co. has been down here at various times and I think perhaps, either justly or unjustly, some of you think that the Toledo Scale Co. is a knocker; if so, I hope this conference will end that. In other words, I think this will be the last time. I think I feel a good deal as the Irishwoman did, of whom you have perhaps heard in a recent issue of a magazine. Mrs. Carr, who evidently was a good Irishwoman and a good housewife, met Mrs. Mulvaney, and found she had the twelfth little Carr in her arm. She said to her, "Mrs. Carr, I see you have another little girl." "Yes; I have, and it is me that is hoping this will be the caboose."

If there is anything of that kind, it is me that is hoping it will be the caboose and any such impression will end right here. Self-preservation is the first law of nature, and it may be for the interest of business generally that the Toledo Scale Co. has made some criticism, or said some things that some of you may not have agreed with and felt some antagonism toward, but after all we both ought to be on the same mission. The sealers, above everybody else, should cooperate with the manufacturers of automatic computing scales, because computing scales now tend more to accuracy than any other device in the retail trade. To verify that statement, is there another device other than the computing scale that can tell you accurately what 10 cents' worth of a commodity is at 35 cents a pound? Your ordinary avoirdupois weights are not arranged in that way, but you have to approximate. But if a computing scale is made accurately your customer can get exactly what he pays for. If what I say is true, that the computing scale is the only device by which you can determine those things accurately, then you should do what you can do to help us make a good computing scale, rather than have a feeling that they should be discarded.

I think the idea that the computing scale should be discarded is fast dying out. I think that time has gone, and your aid together with our aid ought to make the practice that all of us will be better off for and that the public will be better off for.

First, I want to call your attention—because I shall not be permitted to speak when this matter comes to a vote on the floor—to certain suggestions we have made as to the amending of the tolerances and specifications. A letter was received by us and we have written to your secretary, embodying the suggestions, but we will not have a chance to present them on the floor.

First, we have recommended that specification 23–A, page 12, of the original specifications, as printed last year, read as follows:

All scales shall give correct weight indications, within the tolerances, whether the load on the platform, pan, plate, or scoop is being increased or decreased, provided that the weight is added or removed in such a manner as to cause the chart or indicator to vibrate to both sides of the balancing position.

We agree that a scale ought to operate the same, going or coming, but it should not be susceptible of a trick manipulation by removing those weights in such a manner that the scale will not vibrate and be given a chance to settle in its correct position. That is practically what you have in the specifications now, but with such modifications, with such a test of a scale it would be handled, if any of you were handling it, honestly. It is a mere clerical change to prevent manipulation of the device. You do not want to condemn a scale by tricking the scale, but you want to test it in the way it is ordinarily used and not abuse the instrument in order to find some fault with it. It is a very slight change, and we suggest that that change should be made in fairness to the scale. We wrote in our letter:

> We believe the wisdom of this suggested change will appeal to the committee. The regulation, as worded above, affords the protection desired, yet eliminates the possibility of an improper test.

I do not think I need spend much argument on that, because you people know this better than I do, and it will appear to you to be a fair statement of the regulation. Your attention is directed to 23–B, page 12:

> We have contended right along that there was no place in these specifications for such a clause, because the specifications have not attempted to go into scale construction. There are many objectionable features about scales which are not remedied in the specifications. If the committee insists upon this clause being in, we suggest that it read as follows:
>
> "All devices intended to increase or decrease the capacity of a scale by the addition or subtraction of a weight or weights shall operate properly, irrespective of the speed, when properly manipulated."

I do not think that that provision should be in your specifications and tolerances, not because it is not clear enough, but there is no reason why such a provision, which applies only to the Toledo scale, should be in the general code. There are lots of objections urged to scales in general which you do not attempt to correct. However, if it is necessary for that to be in the code, then what I have urged before applies to this, that such device should operate properly when the scale is properly manipulated. It is not fair to so manipulate it that a scale will not have a chance to act. A merchant will not do that in actual practice. If you are going to test a scale, test it by using such device properly. Such modification as that, we say, is only fair. We do not think, as I said before, that that provision should be singled out and put in a code of this kind when there are thousands of different things to be considered. You could say a scale should not be put upside down; but if you want that provision in, then it should be modified, "when properly manipulated."

In other words, some sealer without the intelligence of you gentlemen, who follows these things literally and who might become the tool of some unscrupulous rival could show how to take that weight and slowly twist it, and literally that provision would exclude such a scale. Would that be a fair test of a scale? Certainly not. So, if you want the provision we respectfully suggest that those words be added, "when properly manipulated," so that there shall not be any improper use of it.

On page 20 (page 8 of the advance report), under the heading "Tolerances," we recommend that the word "weight" be inserted between the words "minimum" and "graduation," in line 7, and also

in line 13. It seems to us that the committee so intended it. The specification would then read:

Tolerances: Except on the special tests described above, the tolerances to be allowed in excess or deficiency on counter scales shall not be greater than the values shown in the following table: *Provided, however*, That the manufacturers' tolerances or the tolerances to be allowed on new counter scales shall not be greater than one-half of the values given: *And provided further*, That the tolerance on counter scales at any load shall in no case be less than one-half of the sensibility reciprocal of the scale at the load in question; and when the scale has a reading face or dial the tolerance in no case shall be less than one-fourth of the minimum *weight* graduation on the reading face or dial, except that on new scales they shall in no case be less than one-eighth of such minimum *weight* graduation.

The word "weight" should be in that provision. Undoubtedly they left that out unintentionally.

As Mr. Kelly suggests—

We are still of the opiuion that the committee has made a grave mistake in granting to spring scales greater tolerances than are granted on other scales, all the scales being used to weigh the same commodities. No country in the world, so far as we have been able to learn, has proceeded in this manner. In many countries spring scales are rejected entirely; but where they are permitted they are given the same tolerances as the others. As a matter of fact, the tolerances for spring scales should be less than other scales, because in spring scales you are liable to have an error, due to temperature, which would not show at the time of testing, as well as errors due to other inaccuracies in the scale.

I am not going to spend much time on that. Perhaps I am blind and obtuse, but it seems to me as axiomatic that a straight line is the shortest distance between two given points; that it is the use to which you put a device which determines what tolerance should be allowed. A man who goes away with less sugar or tea because he has been served on a spring scale does not think of the device but of the result. It is the result which you gentlemen are aiming to control, and I do not care what tolerance you give. I am not saying a spring scale should be put out of business, but if you establish a tolerance for a spring scale the same tolerance should be granted on any other scale used for the same purpose. It is logical, and I confess I can not escape from the logic of that contention. However, with that in mind for what it is worth, on page 21, under the heading "Spring scales," the following regulation appears:

The distance between the indicator and the reading face shall not exceed 0.12 inch.

On page 24, under the heading "Computing scales," the following regulation appears:

The distance between the chart and the weight indicator shall in no case exceed 0.06 inch.

Now, gentlemen, is there any warrant for that? Is there any warrant for the fact that in one case you are doubling the distance of the other? As Mr. Kelly sets out in his letter—

The distance in each case should be the same. In fact, there is every reason why the indicator on a spring dial scale should be closer than on a computing scale, because the spring dial scale is suspended in the air far above the merchant's eye and the purchaser's eye, and the error due to the parallax will be much greater than upon a scale resting upon the counter between the merchant and the customer. We have contended all along that 0.06 inch is too close for computing scales. We suggest that No. 8, on page 9, be made to read, "0.09 inch."

That is the compromise between the two. But a scale hanging up here is very much more liable to be the cause of error than a scale right down here before your eyes, where you are looking at it and almost in a perpendicular direction.

However, if you do not think that all we say is fair, certainly the contention I request, that 0.09 inch be allowed to both, is fair. Give us 0.03 inch more and take 0.03 inch off from them. In other words, it is a splitting of the difference. You can not justify the discrimination. Be consistent and fair, and if you do not want to make them both 0.12 inch or both 0.06 inch, then make them both 0.09 inch, and call it a tolerance if you want to. But there is no reason why this difference should exist.

We suggest that specification 5, on page 24, read as follows:

All computing scales shall be equipped with weight indicators on both the dealer's and customer's sides, and their width, if made of wire, shall not exceed 0.015 inch. The distance between the chart and the weight indicator shall in no case exceed 0.09 inch.

It would not be fair to make that read retroactive now with all the scales out in the field that have been sold and bought by people in good faith; it would not be fair to dismantle all those scales and compel those people to use a scale that you think might be better. Each year there is an improvement, but there is no reason why a man who bought an honest device should be compelled to change it.

Both indicators shall reach to the graduated divisions and shall indicate clearly and correctly.

The committee will appreciate that there are indicators much wider than 0.015 inch which should be approved.

Literally, if that was followed out it would rule out the indicator on the fan scale which might be an inch wide and make no difference.

These are wide indicators used on fan scales, the correct weight or the correct price being indicated by a sharply defined point.

In other words, it is not the width of indicator on fan scales that determines the result, but it is the sharply defined point—the point of reading—that determines whether you can read accurately or not, and if that was applied to the width of the indicator it would be an injustice.

We recommend that No. 6, on page 25, be changed in the same way.

Now, gentlemen, here is one that is perhaps a little more serious:

We recommend that No. 9, on page 25, be made to read:

"The clear interval between the weight graduation marks and the clear interval between the value graduation marks upon all computing scales shall be not less than 0.02 inch, provided, however, that the latter requirement shall not be construed to apply to the special value graduation denoting the 5-cent interval mentioned heretofore."

In other words, as you probably know, you make a difference of just double in the distance which you require the value and the weight graduations to be apart. It is the same eye that is going to read these graduations. Whether you call them value graduations or whether you call them weight graduations, the optical effort is exactly the same, and to assume the contrary is absolutely absurd. Your eyes do not adjust themselves to the requirement of whether it is weight or value you are reading, but your eyes are working automatically and reading as well as they can, irrespective of whether it is weight or

value. That, of course, is true. There is no warrant for that condition, but what is the effect on the scale manufacturer of that provision as it stands now regarding these weight graduations to be not closer than four one-hundredths of an inch? Most of you know, I think, of the 10 and 20 pound scale made by the Toledo Scale Co. It is a scale which up to 10 pounds reads in black and, by the change of a weight, the same scale has a 20-pound capacity. That provision as it stands now absolutely precludes the use of that scale. Now, is that right? If it was changed so that they were both the same and the two one-hundredths of an inch was allowed in both cases, then the scale can be used. Those of you who are familiar with the scale know of the very great excellence of it. Up to 10 pounds in black there is a weight space most easily read, and after 10 pounds it is universal almost that the party using such device as that would use the value rather than the weight graduations.

How many transactions do you think there are when a man comes in and asks for 10 pounds 1½ ounces of a commodity? I do not suppose you ever heard of such a transaction. Below 10 pounds there is not the slightest objection to it, but if the specification applied, as it now stands, the scale would be ruled out. Although in 10 pounds, I venture in ninety-nine cases out of one hundred, it is the value indication that is used instead of the weight graduation, and in those cases in which value graduations are not used it is an integral part of a pound that is called for. A man does not come in and ask for 10 pounds 1½ ounces, but he will ask for 10, 12, or 14 pounds. So there is no necessity for that provision, and if you have that provision, then be consistent and make it two one-hundredths of an inch in both cases. I do not suppose that a member of this conference knew when that provision was adopted that they were absolutely preventing the manufacture and sale of this 10 and 20 pound scale, because, I believe, that almost all of you who are familiar with the device know the excellence and the necessity for it. It is one of the best scales ever manufactured.

Specification 13, on page 25, should read the same as specification 23–A, page 12, "Computing scales shall give correct results, whether load is being increased or decreased."

That, I think, I have reverted to before, when I spoke of correct results if the scale was properly used so that there was a chance for it to vibrate.

Specification 14, page 26, should read the same as specification 23–B, page 12, unless it is decided to eliminate it entirely under the heading of "Computing scales."

I have already discussed that and said that it was a special provision provided for our scale alone.

There is one other matter that I want to revert to in closing. In a letter of Dr. Stratton he said to the manufacturers that one day would be given over to the manufacturers "for any subject they might deem of interest to the conference." In passing I wish to say that there is before Congress now, as you probably know, a bill known as the Ashbrook bill, which will remove the question as to what type of scales are to be used from the jurisdiction of the State to the Federal authorities at Washington.

Without going into the constitutional questions involved in that bill, the Toledo Scale Co. has sent a brief in opposition to the bill, and I can briefly tell you what the constitutional objection is.

The provision upon which this bill is predicated is that Congress shall have the right to fix—bear these words in mind, because they are all the words in the Constitution on which this is predicated—the standards of weights and measures. Under the guise of establishing standard weights and measures, this bill does not do anything of the kind. The bill attempts to delegate to the Director of the Bureau of Standards, an individual, against whom I have no criticism—I do not care whether it is the Director of the Bureau of Standards or the mayor of Washington—not what the Constitution said the Congress had the right to do, but the power to regulate the device, the machine, which shall be used after Congress has fixed the standard of weights and measures.

As most of you know from your schoolboy days, all the powers which were originally in the States are still there, unless they have been expressly delegated or absorbed by the Federal Constitution. This power has never been delegated to Congress. The only power delegated to Congress is to fix the standard of weights and measures. As was aptly said by one of the men before the committee, you might just as rightly and legally attempt to tell a surveyor what sort of a transit or surveying instrument he should use in measuring, as to tell the user or manufacturer what device he shall use to get into effect the standard weights and measures which Congress has fixed.

Gentlemen, it is an attempt to remove from the State a power which is justly there, which is rightly there, and which has never left the State. What are the practical objections to such a bill as that? A scale before it can be used under this bill must be submitted to the Director of the Bureau of Standards and a serialization of that type of scale must be obtained. A year from now, under that bill, although there are hundreds of thousands of scales in the United States that have been bought in good faith, many of which scales were manufactured by men who have long since gone out of business, to have one of those devices in your possession is a penal offense and may subject you to a $500 fine and imprisonment, and what else? Prosecution! Where? Where your friends are? Where the equities may be indulged in your favor? No. In the United States district court.

What does prosecution in the United States district court mean? Unfortunately it is the letter of the law rather than the spirit of the law that seems to animate prosecutions in Federal courts. To be accused of a crime in the United States district courts is a most expensive thing for the man who is accused, even if he gets rid of the accusation. All offenses under this act shall be prosecuted and punished in the United States district court. Now, gentlemen, to dignify such offense with prosecution by the machinery of the United States district court is ridiculous. In most cases, as you know, it is only necessary to call the user's attention to the fact that his scale is wrong in order to have him correct it, but under this bill to merely have in possession makes it a penal offense and punishable in the manner to which I have called your attention.

What would be another practical difficulty? Thousands of scales manufactured in the United States, thousands of types manufactured

in the United States, it would be impossible for anyone to use until such a scale had been submitted to the individual, no matter who it is, no matter whether it is Dr. Stratton or some successor of his. There would soon be a glut, and it would soon be impossible for the merchants of this country to do business. Dr. Stratton is human, and you might get someone in the office more human than Dr. Stratton, and I say more human in that he would be weaker, because to err is human, and it is possible that somebody in the future would find it to his advantage to delay the examination of some particular type of scale and hurry the examination of another type. Such power should not be given to any individual, no matter how good or strong he is. It is too great a temptation. What would that power amount to in the case of a corrupt man? Under the present head of the Bureau of Standards we could perhaps delegate that power, but I do not suppose for more than 20 years longer he will be at the head of this bureau, and in the hands of one individual who is bound to twist that power to his own ends, imagine what that would mean. There is no office in the country that would compare with it for what is known as graft. It is true the bill says that if an applicant for such registration is dissatisfied with the decision of the Bureau of Standards he may have appeal to the Secretary of Commerce. What does that mean? You may as well say he has appealed to the King of the Fiji Islands, because the Secretary of Commerce is a busy man, a man who is not familiar with the design and construction of scales and is appointed on account of entirely different qualifications. He is not a man you would ever think of going to. To appeal to the Secretary of Commerce is to leave the decision of the director of the bureau here absolutely final.

For these reasons the Toledo Scale Co. has felt that it was its duty to object to that bill, and if the Toledo Scale Co. has been called a knocker, it is not in what it believes to be an unwarrantable campaign. Gentlemen, I thank you.

The CHAIRMAN. I want to express my appreciation of thanks for the many kind remarks made by the last speaker. I do not think I have ever known of a case that was appealed, and there were many with which I have been acquainted, to which the secretary has not given most careful consideration, especially the present secretary. It is a great mistake to think that all administrative bodies are crooked, or liable to crookedness. Such a thing is the exception, and I will say that for Government business and Government decisions. I believe when it comes to fair, unprejudiced action, there is no place where you will get better and fairer decisions than you will from the Government. That has been my experience.

I want to say that more time than that allotted was given in the last case, because I felt it was rather an important matter and this must be had at some time. I will give the rest of you all the time you require, if it takes us until 12 o'clock to-night.

THE NEED OF A UNIFORM METHOD OF MARKING TOILET PAPER, BY J. G. LAMB, OF THE SCOTT PAPER CO.

Gentlemen, I am very glad to have the pleasure of coming here, representing one of the manufacturers who is trying to put into their particular business honest methods, and I do not know of any busi-

ness where there are as many methods that might not be called square as there are in the toilet-paper business. There are a great many practices which need looking into. I can best illustrate what I have to say toward a uniform method of marking and measuring by taking up the question of the quantity of toilet paper in a roll. We want a uniform method so that the consumer in San Francisco and the consumer in New York can go into a store and know what she gets for her money, and I can best illustrate the different methods now used in selling toilet paper by some samples which I bought yesterday in some of the stores in Washington.

One method is this: The manufacturer of toilet paper will make a roll as cheap as he can; he will sell it for as much as he can; he will not mark on that roll anything to show what is under the label; and the consumer, going into a store, has absolutely no way of knowing what she gets unless she stands in the store and counts the sheets, and she would not do that. So that we find this: You have probably seen in your department stores advertisements of great bargains in toilet paper "three rolls for 10 cents." I bought this roll [exhibiting a roll] yesterday in a store at the rate of two rolls for 5 cents. There is no marking of quantity on there except the words "four ounces." How do I know, as a customer, what it means? I counted the sheets, and there were 270 sheets for 5 cents. If the manufacturer of that was not ashamed of that number why did he not put it on there?

In a 5-cent roll we would put on there "650 sheets 4½ by 5 inches." Here is a roll [exhibiting another roll] which you as a consumer would think was a great deal. That roll weighs 14 ounces and is so marked. I counted the sheets, and it has only 900 sheets in it.

Here is another roll [exhibiting it] which is just half the size, and I do not know what the weight is, but it is marked "1,000 sheets," and the price is the same. If the manufacturer was not ashamed of his 900 sheets, why did he not put it on there?

I bought this roll yesterday [exhibiting a roll] and I paid 10 cents for it. It is wound very loosely, and it has only 510 sheets of paper in it of a very poor quality. It has not a thing on it to tell me as a consumer what is in it.

Here is another typical example [exhibiting another roll] of what we in the trade call "puffing." It is wound up loosely. I bought that at one of the stores, and it is a typical case of what is being done in this connection.

So, gentlemen, we merely want you, as men who are interested in weighing, to see that the consumer gets value for her money and to help us, as one of the manufacturers wanting a uniform method, and to have put on there the number of sheets, the size of the sheets, and let the consumer judge for herself the size and quality, and have on there plainly what they are getting for their money. That is the only honest way.

If a manufacturer makes a roll containing 1,000 sheets, and puts in it 1,000 sheets of a good, thin, strong paper, it will take actually less paper than a paper weighing a great deal more which is of poorer quality. So, if we ever did get a law, or a ruling on this, the whole business would be put on a much better basis.

We desire to emphasize the importance of some State or National action which will make one uniform method of measuring quantity in toilet paper.

In order to bring out the importance of this point, allow me to sum up ways in which toilet paper is sold to-day, many of which tend to confuse and deceive the consumer.

First. Some toilet paper is sold to-day on which nothing is marked on the roll whereby the consumer can judge what quantity is being obtained. This very evidently leads to deception, though not always intentionally. Such rolls are often advertised as 3 rolls for 10 cents, 10 rolls for 25 cents, etc., but a roll of toilet paper does not signify any definite amount, as the quantity may vary.

Second. Some toilet paper is marked, showing the weight of each roll, for instance, 5 ounces, 8 ounces, or 10 ounces. Such weight in the consumer's mind does not mean anything and weight may be very deceiving. For instance, a roll of toilet paper can be made of heavy paper and may contain only two or three hundred sheets, and yet the roll may weigh 10 ounces. A roll of thin paper can be made to weigh 10 ounces and yet contain 1,000 sheets, though thin paper of a high quality actually costs more to produce and is considered by consumers as being of a much better grade and is always to be preferred to heavier paper. Therefore, marking the weight of the roll is deceiving and makes it impossible for the consumer to judge the real quantity.

Third. It has been a practice among toilet-paper manufacturers to make a roll very large by loosely winding it, as the trade expression goes, "puffing it," to give a big appearance. This is done for no other reason than to deceive the consumer into believing that the roll contains great value. As a matter of fact such a roll may contain less paper or sheets than a roll one-half its size.

All such methods of marking tend to confuse the public, but on the other hand if the manufacturer is not ashamed of the value of his product, why can there not be a uniform method of measuring quantity?

The only true and honest measure of quantity is the number of sheets in a roll, and the number of sheets should be marked plainly on each roll of toilet paper, together with the size of the sheet. For instance, a roll should be marked 1,000 sheets $4\frac{1}{2}$ by 5 inches.

Under a commodity act passed in the State of New York December 1, 1914, the following ruling was put into effect.

"*Toilet paper.*—Toilet paper must be marked with either the net weight, the gross and tare weight, or the number of sheets. When sold by number, the size of the sheets shall be indicated. The lettering shall be at least one-ninth of an inch, or 8-point type. The variation allowable on weight rolls will be 8 per cent, the variation on count rolls will be 3 per cent."

This ruling is unsatisfactory in that it allows toilet paper to be sold by weight, which, as has been proved above, is not a safe method for the consumer to use in buying toilet paper.

If by law all toilet-paper manufacturers were compelled to sell toilet paper only by count, being made to mark the number of sheets and the size of the sheet plainly on the front of each roll, the consumer would then be able to judge just what was being received for the money invested.

Having proved, therefore, that it would benefit the consumer greatly if toilet paper were sold under one uniform method, that being the number of sheets in a roll, the following is suggested as a correct wording for such a law, which could either be a law in itself or part of a State or National commodity act.

"*Toilet paper.*—On the front of every roll or package of toilet paper must be marked the number of sheets which the roll or package contains. The size of each sheet must also be shown. When one or more rolls or packages are packed in a carton the number of sheets in the carton and the size of each sheet must be marked on the outside of the carton. The lettering on the roll, package, or carton, showing the number of sheets and the size of each sheet, must be at least one-ninth of an inch, or 8-point type. The variation allowed on the count will be 2 per cent."

If such a law or act, as suggested above for toilet paper, can be put through, we would also suggest a similar act covering paper towels. The wording for such a law or act we suggest could be the same as has been suggested for toilet paper, with the words "paper towel" inserted where "toilet paper" appears.

DISCUSSION.

Mr. KELLY. The subject is very important, I think, and merits quite a lot of discussion. I would furthermore amend the resolution that was suggested by requiring that a statement of the chemical analysis of the toilet paper be included on the package to prevent contagion liable to result from contact with the human body.

Mr. LAMB. May I answer that question? That could be very easily done. If chemical or wood pulp is used in making paper there is absolutely no danger of contagion, however, because the heat that it goes through is so great. However, that could be put on, but it would be a burden on the honest manufacturer, which I do not think is necessary if the paper is good.

Another thing I wanted to say in mentioning this thing to some manufacturers, they will probably state that if they were ever made to put a count on the paper they would have to change all of the machinery. That is ridiculous, because in order to make the weight of a roll of certain weight it is necessary to put in it an average number of sheets. They have to count the sheets anyhow to get the weight, so why not put it on?

Mr. REICHMANN. I would like to say a word about the subject. Some years ago I took up the matter of toilet paper and found there was a great diversity in the number of sheets, and before we had a law in the State of New York requiring the putting of the weight or measure on all packages I found two companies that were spending in the neighborhood of $25,000 a year to combat short weight. I have seen hundreds of stores where they advertised toilet paper by stating, "Why pay 10 or 15 cents for a small roll when you can get a big roll for 5 cents." The public have no way of knowing what is purchased.

I think in the State of New York, under the container law, the matter has been regulated, since they do have to put the weight or measure on the outside of the rolls, and I think it has been a great benefit principally to the general public and, of course, to all

the honest manufacturers. But most of the States do not have a quantity-container law, and most of the States, like the Federal Government, go on the proposition that they do not have to be protected. As a matter of fact, most people spend a very small amount on food, and we, in the State of New York, believe we should be given honest weight or measure on every commodity. The fellow who is crooked will find it the easiest thing in the world to get away with it on paper towels and toilet paper, and he can get away with a good deal.

The CHAIRMAN. The next on the list of manufacturers is Neidlinger Bros. [After a pause.] There seems to be no representative here from that company.

REMARKS BY G. CARLTON HOSCH, PRESIDENT OF THE MEASUREGRAPH CO.

Through the courtesy of the Bureau of Standards I was allotted time, and as it is getting late I will only take a few minutes and demonstrate the new fabric-measuring machine, the measuregraph, for use in dry-goods stores. We have developed various types of this machine, but we have put on the market only three sizes at the present time, and we are presenting just these three to this convention.

The need for a machine of this kind is well known among all of the trades. This machine enables a clerk to give 36 inches to the yard, and it computes prices automatically and simultaneously with the movement of the goods through the machine, thereby affording protection to the merchant, the clerk, and the customer. We have in our home offices every patent that has ever been granted on a measuring and computing device, and the number is about 500. I am sure you will ask, then, why have not some of these machines or devices been put on the market. The answer is very easy. The average mechanic attempting to work out a machine of this kind knows nothing about fabric textures or thickness of cloth; consequently, when it comes to building a machine that is to be practical on the counter, they do not get much further than the Patent Office. We are the first to present a machine of this kind.

The measuregraph is the outgrowth of 20 years' experience of a successful dry-goods merchant, a man who spent his life in the trade, and by employing mechanics to assist in the mechanical part of the development we have perfected a practical machine, and I use the word "practical" again because practicability in a machine of this kind counts for more than anything else outside of its accuracy.

The measuregraph is simple to operate, it is durable, and the method of installation on the counters means convenience to the clerk, because it is installed on a track, on the edge of the counter, which enables the clerk to move the machine to any position desired—in other words, two or more clerks can use one machine.

As you all know, there are two present devices for measuring, either the tack driven into the counter or the yardstick. There are tacks of all sizes with heads from the large size down to the very small. Some stores use yardsticks by hand and others have the yardsticks fastened to the counter, and I have in mind one store in the

West that has gone to the expense of several hundred dollars of mortising into the counter several yardsticks. That is bad, because it leaves it to the eye of the clerks to gauge the distance. With the measuregraph there is only one way. The amateur can take this machine and in two minutes be using it, but when we install them we first teach the clerk in the classroom how to use the machine. We send our experts, who spend hours at the big stores instructing the clerks before it goes on the counter. A clerk is paid for his ability to make sales and not to measure goods. You will find that that is the case. The mental counting of the yards and the computing of the price are both mechanical movements and should be done by a machine, and with this machine the clerk can measure the yardage for the customer and it is computing the price at the same time. Therefore, the clerk can give you his entire time and attention.

Those of you who know something of the department-store business and the crowded counters and the clerks trying to do two or three things at once, answering questions and trying to count 1, 2, or 3 yards, and the customer wanting to know where the glove counter is, know of the chances for error all along the line. With this machine all of that is prevented.

The percentage of failures among dry-goods merchants is very large, and I think we are right when we say that the shrinkage cost from inaccurate measurements by the clerks is one of the great causes of so many failures of dry-goods stores. A merchant will buy 20,000 yards of goods and charge the department with that number of yards. When he takes an inventory and figures how much has been sold and how much remains on the shelves he finds quite a shrinkage, due to inaccurate measurement.

The dry-goods economists of New York got out a little book entitled "Twenty store leaks," which they gladly furnished to all merchants and subscribers, and in this list they designate as No. 1 "Leakage of goods," so they think it the greatest or they would not list it as No. 1. They figure the overmeasure as 1 per cent.

We have made an exhaustive study of this subject and made purchases in every State in the Union at practically all the larger stores in the largest cities and in the smaller cities, and our records show the average loss in overmeasurement, together with the errors of computation, to be about 3 per cent. That 3 per cent comes out of the merchant's profit, and is quite a loss. Oftentimes the customer will get short measure, and these machines will prevent that.

A gentleman was yesterday discussing the weighing of groceries, meats, etc., and he brought up the subject of pork chops. The measuring of fabric is different from the weighing of groceries. One customer says that she wants 2½ yards. That is a predetermined measure and the clerk can measure 2½ yards. Some of the largest stores in the country have made a demonstration there, and one-eighth of a yard is as close as they care to come to the price, and this machine computes the price in quarters and eighths of yards.

There is one point I also want to bring out, that this machine is entirely free of adjustments which you will find on some scales. It is so designed that it can only measure and measure right, which I am sure will make it welcome to all of the weights and measures officials.

It is the desire of the merchant to give full, true, and accurate measure at all times, but he does not want to give a customer more than she pays for. If she gets several inches more than she pays for she is getting the best of the merchant. For instance, I made several purchases in Washington, as we do everywhere we go, and here is a piece of goods bought where I called for $2\frac{3}{4}$ yards, and it will interest you to know there are $5\frac{1}{2}$ inches of goods more than I paid for. Here is another piece, supposed to be $2\frac{3}{4}$ yards, which contains $2\frac{1}{2}$ inches more than I paid for.

Here is a piece of silk chiffon $2\frac{1}{2}$ inches over. Ninety per cent of the measurements made by the clerks in the stores we find are over. Five per cent are within 1 inch of being correct and 5 per cent short. Our inquiries so far show that 1 out of every 11 sales checks shows error in computation.

The efficiency of the machine is this: The customer walks in a store and asks for $2\frac{1}{2}$ yards of this piece of goods; the clerk takes the goods, not from the side, but from the end, which is the proper way to measure, drops the goods in the machine and the thumb touches a button in line with the cutting shears. The only operation necessary is to draw the goods through the machine until the proper amount is recorded. By pressing the button we notch the goods in the same line we started, which gives correct measurement. The machine makes a little notch in the goods to show the clerk where to cut and the total price at a given price per yard is recorded. The third move is simply the touching of the button which returns the hands to zero automatically. This machine is the type suitable for silk goods.

We have another type of machine for the ribbon department. This machine is the same, so far as the measurement is concerned, but in addition it holds the bolt, rolls, and rerolls the ribbon, and computes the price simultaneously. By touching a button the ribbon is held firmly and the cutter instantly cuts it off. There are $2\frac{1}{2}$ yards of ribbon rolled as it comes from the merchant and it will not crease. Two and one-half yards at 49 cents amounts to $1.23. The young lady working at the silk department has no longer to use scissors because by a touch of the thumb the machine instantly makes the cut squarely across.

We have a third machine of this character used by the belting houses and wholesale stores. We also have three other types of machines which we are not showing here, one a large machine for taking any width of bolts, which works electrically, and will unroll, measure, and reroll any kind of goods.

In order to appreciate the measuregraph you have to see it in operation in such a manner that you can see the dial, etc., and I will be very glad to demonstrate to any of you gentlemen personally what the machine is. In the last six or eight months we have been introducing our machines in the Middle West and we will soon be in the East. We will be in to see the inspectors as we want to cooperate with you, and we are doing this before we are putting the machine on the market.

I will be glad to answer questions now or later and demonstrate the machines further to any of you who would like to see them.

DISCUSSION.

The CHAIRMAN. Gentlemen, this is very interesting that we should begin to take cognizance of measurements of lengths. We have always let that go by, paying but little attention to it. But here we have an instrument for measuring lengths, and what is still more surprising, a machine for computing. Let us hope for a time we will not have too much rivalry in the machines here, and then let us hope this machine will be developed and put on the market in the proper way. Let us hope it does not follow the usual line of such devices, and I refer to all sorts of typewriting and computing machines and devices of that kind. Unfortunately the cost of distribution is tremendous—it is one of the most important things before the using public to-day. A machine that cost $10 or $12 to manufacture should not cost the public $100 and more. Let us hope that this will remain free from that ill.

REMARKS BY R. F. CHATILLON, OF JOHN CHATILLON & SONS.

Mr. Chairman and gentlemen, I have been very fortunate in the fact that my paper has not arrived, so I can not keep you very long. There are a couple of points that I want to bring up in regard to the paper read by the Toledo Scale Co. One thing they mention in that, is about regulations being different for spring and computing scales. To a great extent it should be so. To a lesser extent they ought to be the same. Some spring scales go into shops, but at the same time many are used on wagons. You can not have a delicate instrument for such purposes when a distance of 0.12 of an inch between the indicator and the dial is needed. In a scale in the shop we do not need so much distance. Make your regulations and we can meet anything you want.

I want to say the house of Chatillon is ready to meet you on any accuracy you want on spring scales, but again bear in mind the more accurate you get a scale the more delicate it is, and do not forget your regulations not only apply to shops, but also to peddlers' scales and those used on wagons, which to-day have a good service that is over 99.6 per cent correct. Gentlemen, I thank you.

REMARKS BY ALBERT GUARDIA, SALES MANAGER, PELOUZE MANUFACTURING CO.

Mr. Chairman and gentlemen, I was mighty glad to receive an invitation to attend here. In my notification calling me to Washington I was informed that Mr. Triner was to speak on the subject of springs. He has a comprehensive paper and I am hoping he may send the paper in because I think it will be instructive.

Therefore I am not prepared to talk on the spring-scale subject, only following the words just uttered by Mr. Chatillon, the spring scale of to-day is an entirely different proposition from the spring scale of yesterday.

The manufacturers have always thought what a wonderful thing it would be if they could have a little more spirit of cooperation between the inspectors of weights and measures and the manufacturers, and since I have been in Washington I want to take up a subject which I think will appeal to all of the inspectors. I have had a little

over 20 years' experience in scales. In the course of time I have met a great many inspectors of weights and measures; I have seen the difficulties under which they work; the difficulties that they have to meet out in the field, and their desire to do the right thing. I remember years ago when a manufacturer would look upon an inspector of weights and measures as a joke, all that he was after was the fee for sealing a scale irrespective of whether the scale was correct or not. I am glad to say that that is a thing of the past. The manufacturers to-day look upon the inspectors of weights and measures as a component part of the system. The inspector of weights and measures knows what he has to do; he gets his information, I presume, from the Bureau of Standards, and he meets in conference, takes up different subjects, and he believes that the decisions are right. When he meets the manufacturer, instead of finding an enemy he finds a friend. So, bringing up the subject from what I have found out in Washington on this trip, I have thought if the conference could devise some method or some manner where they could organize a committee to cooperate with a committee from the manufacturers on difficult points it would be a very good thing .

Another vital point is the sending of inspectors of weights and measures from the different States to the conference. I find there are quite a few States not represented here. I have run across some of the inspectors in these States that you gentlemen no doubt do not know, and I have found them intelligent; they work right up to the standard and want to do the right thing, but the failure of a State appropriation and the low salaries they get preclude them from attending the conference. I know in my own city of Chicago we have what is known as the manufacturers' association, and they are ready at all times to help any movement that is a betterment for the trade. I know that our manufacturers' association would not hesitate a moment to invite the officials at Springfield, Ill., with the inspectors from cities and towns, to attend these conferences, and appropriations should be made by the State government so that they can attend the conference. I do not mean simply allowing them their railroad fare and a scaled-down hotel bill, but money sufficient to carry them through for the work they have in hand, and I feel that if the conference was to take this up and work on it that you will have the cooperation of every manufacturers' association in America, and they would be back of you in it, because they do the right thing and they want to follow out the suggestions of the conference. I do not mind saying what takes place in this building is more vital than anything else that can take place. We have to come to you for knowledge, and if we work against you we can not accomplish results.

My paper will be submitted, and I want to say that we of the spring-scale end are doing everything possible to meet your views, and I am glad to say we are accomplishing results. Gentlemen, I thank you.

REMARKS BY D. A. COREY, OF S. F. BOWSER & CO. (INC.).

Mr. Corey. Mr. Chairman and gentlemen, I agree to take a very few minutes, because it was not my personal privilege to be here on Tuesday when the subject of measuring pumps was taken up. I do

not know just what was said, because the paper was not available, but I have felt, in view of some conversations I have had with the sealers here, that it might be in order to emphasize some points which would be advantageous and, I trust, useful.

I presume there is no business in the United States that is so harassed as the manufacturers of the measuring pumps. We have State laws and regulations to comply with; we have city laws and ordinances and department regulations of every kind—street department, fire department, combustible department, etc. We also have to meet the insurance requirements; and there is no uniform standard, but instead a large variety of standards. Many of these things enter into measurement and mismeasurement.

The height of lift pumps, as you all know, is a factor, the liquid to be handled is another, and the depth at which the tanks are buried enters into the equation. In one of the large cities of the country they specify that the tanks shall be buried 18 inches under ground. Two feet is a common designation, 3 is frequent, and 4 feet is not unknown, and one Southern city has gone to the extent of saying that the tank must be buried 6 feet under ground—absolutely absurd, of course.

I am speaking of regulations which the pump manufacturer must meet, and speaking of them simply so that you may know that we are up against. Some of the regulations say that gasoline must be discharged directly from an underground tank to the automobile through a hose without exposure to air. Most of the regulations provide that no open vessel shall be permitted. Others say that there should be a shut-off nozzle, and others not. Some of those things do not concern the sealer, but all of them are requirements that the dealer must meet and with which you should be acquainted.

The handling of gasoline has a special hazard and requires more than passing consideration. At the same time, from the meager reports that I have had opportunity to see, it appears measuring pumps are higher in accuracy than most other kinds of measuring devices. I take that from reports of sealers of weights and measures that I have seen.

In this connection there is a condition worthy of your careful thought and consideration, and I refer to the tolerances allowed. One of your prominent members has made the suggestion—I heard this a long time ago—that in view of the conditions of use and mechanical nature of the devices, that tolerances be increased over those designated for liquid measures. This man is one of long and broad experience and one to whom I am sure you will listen. Recently a sealer refused to seal a 5-gallon pump because he used a measure with a glass slicker plate, and in drawing 5 gallons there were bubbles under the glass. That is an actual occurrence.

I believe that you will agree that that man was not a man of broad experience. The probability is he could not have come as close as that if he had filled a measure through a faucet from a gravity tank.

Another sealer issued an edict that all gasoline should be delivered from sealed measures, and the probability is he is going counter to the fire ordinance of the city or State. There are many things we have to meet, and there are many conditions which the sealer has to take into consideration.

I believe, as a rule, that the pumps are found to be all right, and I believe the sealers generally make that statement, but errors are more frequently due to pipe lines and faulty installation rather than to any other cause. This, of course, does not excuse an incorrect measuring pump, but it does emphasize one of the troubles and shows what to look out for.

There are other things that enter into this. It is not an infrequent occurrence that they send for a man to come to adjust a pump. It happened that one pump had been condemned and they could not get an accurate measurement, and after some long-distance telephone conversations with one of our service men, he went and tried the pump and it failed to measure; he could not get the gallon. He went and looked into the tank and he said, "If you get some oil in the tank it will be all right." That proved to be the case, and it has not been an infrequent occurrence. One thing a pump can not do is to manufacture oil.

In another case we had a wire, collect, saying that a pump was condemned, and it could not be used since they could not get a gallon. The sealer had condemned it, and in this case, after we had an imperative demand for the nearest service man we had, who was over 200 miles away, we wired this man to go to the point and make an inspection. He did this, first going to see the sealer, and together they went to the location of the trouble. He did not try the pump, but looked at it. To appreciate the story you ought to hear the service man tell it. He turned to the sealer and said, "Don't you see that pump is of a half-gallon capacity?" We had sent that man over 200 miles to show why a gallon could not be gotten out of that pump.

Those things seem funny but they are serious, and I am speaking of them simply so that you may know something of the frequent troubles and the things that should be looked into and understood. I am sure all the pump manufacturers are ready to cooperate in any way they can, because the pump manufacturers, I believe, without exception are as reputable manufacturers as there are in any business. The oil pump is regarded as a present-day necessity, and I believe this idea is generally accepted. I have asked your indulgence that I might speak of some of those things for your information, thinking it quite possible there were some of them you were not acquainted with. I thank you.

DISCUSSION.

Mr. SCHLINK. Mr. Chairman, Mr. Corey's remarks are very good. He did not hear my paper of yesterday, but it should be called to his attention that I emphasized the fact that a good many cases of faulty measurement were due to bad installation. In that regard I want to call attention to another point, and that is to unfair publicity. In this morning's paper a number of notes appeared in regard to the paper on measuring pumps, in which the news writers had written it up purely from the sensational point of view of making it a scare head. By such publicity honest manufacturers are given unfair treatment. In this case in particular the attempt was merely to catch the public eye by suggesting that measuring pumps in general were inaccurate. That is unfair, and I know that in many jurisdic-

tions there is a tendency for sealers to give out information in that manner and allow it—perhaps due to failure to properly restrain the news writers—to contain misrepresentations. By so doing the manufacturer is given the idea that the weights and measures men are going to allow misrepresentations to occur. I do not think that condition should be permitted, as it is not fair to the manufacturer himself, who is just as anxious to have correct instruments as the sealer is.

The CHAIRMAN. It is unfortunate in these days that our news is dished up to us not in the form of truth, but in the form that will please the sensational tastes of most people. It is not what occurred that is related, but what would have made a good story if it had occurred in that way. Often there is one sensational feature, and that is taken up throughout the land and attracts a great deal of attention. News to-day has become largely fiction—more fiction than fact.

This has been an exceedingly interesting discussion this morning. Some facts have been irrelevant, but on the whole a great many important technical facts have been brought out, and in the end I think you will find that these discussions will be confined to the discussion of the technical facts, the manner in which these things can be best improved in their manufacture, or, as some gentleman has said, the conditions that the sealers want to bring about. We can overlook a good deal of abuse and bad advertising if in the end we accomplish our purpose.

Mr. HANSON. Before we close I wish to make another announcement relative to the informal dinner which we are to have to-night. We will have the dinner at 6.30 o'clock at the Raleigh Hotel. The price of tickets is $1. The tickets are going like hot cakes, and I suggest to those who have not purchased their tickets that they do so immediately. Immediately after the dinner we take in the moving-picture show in the hotel. Tickets can be purchased from Mr. Willett, Mr. Schoenthal, or myself.

RESOLUTIONS IN REFERENCE TO THE SCALE JOURNAL.

Mr. REICHMANN. I do not know whether it is an appropriate time to bring up this subject or not; but there was some talk on yesterday about the program or the proceedings here having early publication, and the editor of the Scale Journal seems to feel a little hesitancy as to the propriety of publishing the proceedings of this national conference.

I would like to make a motion to the effect that it is desirable for the Scale Journal to publish such papers as the editor of the Scale Journal wants to publish, and also a general synopsis of the whole proceedings so that we can get early publication, as some of the conference reports may not get to some of these people who are subscribers of the Scale Journal.

I would like to make a motion that the Scale Journal be requested, as it may see fit, to publish such reports as were presented at this conference in their next and succeeding issues.

The SECRETARY. I second that motion.

(The motion was agreed to.)

The CHAIRMAN. We have a practice at the bureau that works out well that might be applied here. In case of papers, which are not complete or are in process of completion, abstracts are sent to technical journals, and while the Scale Journal might not want to publish the whole paper, a section of such papers would be very good information at this time.

Mr. REICHMANN. I would like to go a little further and get an expression from the delegates to this conference. I would like to put another motion, namely, that the Scale Journal be made the official organ of the National Conference on Weights and Measures. I would like to make a remark on that motion.

I think the Scale Journal deserves a great deal of credit in taking the initiative in publishing a journal which, as everyone knows who has ever had any experience in that kind of work, takes a great deal of energy and money to publish. They may be on a paying basis, but I doubt it. They may pay a dividend to some of their stockholders, but from the mere fact that they are people who are working hard and are drawing no salaries, any encouragement that the national conference can give to the Scale Journal I think would be in timely recognition of the work they are doing.

(The above motion was seconded and agreed to.)

The SECRETARY. Mr. Chairman, I would like to have the remarks and discussion relative to the question raised by the gentleman from the Old Dutch Market eliminated from the report. He was allowed to speak, though he got in through a misunderstanding. I was asked by some one from the District office if a local dealer could speak on what I supposed would be a subject of interest to the conference, and we find that he wants us to settle a question between him and the local office in Washington. It seems to me we should not allow ourselves to be used in that manner. That is my reason for asking to have the remarks withdrawn. It was purely a question between the local sealer of weights and measures and this storekeeper. I move you, Mr. Chairman, that the remarks of the gentleman be eliminated.

Mr. REICHMANN. I second that motion.

(The motion was seconded and agreed to.)

The SECRETARY. I would like to make an announcement in regard to the photograph. We will have a photographer out at 1 o'clock, and he wants to take a picture of this group of weights and measures officials. I thought if the gentlemen had in mind that it would be taken on the lawn they might regulate their movements accordingly.

The CHAIRMAN. Are there any further notices? The conference will reassemble at the same time as on yesterday; so if there is no other business, the meeting will stand adjourned until 2 o'clock.

(Thereupon, at 12.45 o'clock p. m., a recess was taken for luncheon.)

FIFTH SESSION (AFTERNOON OF THURSDAY, MAY 25, 1916).

The conference reassembled at 2.30 o'clock p. m.
Mr. Waldron, of New Jersey, assumed the chair.

APPOINTMENT OF NOMINATING COMMITTEE.

The SECRETARY. Mr. Chairman, at this time I think we had better appoint a committee on nominations, and I make a motion to the effect that the Chair be authorized to appoint a committee of either three or five to consider and make nominations.

(The motion was seconded and agreed to.)

The ACTING CHAIRMAN. The Chair appoints on that committee Mr. Johnson, of California; Mr. Farrell, of New York; and Mr. Sullivan, of Newark, N. J. Before we start on the report of the committee on tolerances and specifications, is there any special business to come up?

ANNOUNCEMENTS.

The ACTING CHAIRMAN. Gentlemen, the committee on the proposed dinner for to-night have asked me to state that if there is any person here who has not procured a ticket they would like to have him do so as early as possible, in order that they can make their final arrangements.

Mr. CLUETT. At this time, Mr. Chairman, I make a motion that the session to-morrow instead of being held at the bureau be held down town at the Raleigh Hotel. I think if it was held here we would not get a corporal's guard, and we would get a good attendance down there.

The SECRETARY. I might say, having anticipated that, I called up the Raleigh and found out we could have their ballroom to-morrow at 10 o'clock.

(The motion was seconded and agreed to.)

(Mr. Stratton assumed the chair, relieving Mr. Waldron.)

The CHAIRMAN. If there is no objection, we will proceed with the report of the committee on tolerances and specifications.

The SECRETARY. Before we proceed with the report, I would say that through an oversight on the part of the committee no mention has been made of the almost indispensable aid we have received from Mr. Holbrook. Mr. Holbrook has been able to meet with the committee right along and very often has met with them when it was impossible for me to do so. I feel somewhat guilty in signing this report without having his name on it. Mr. Holbrook is perhaps as familiar with the subject as anybody on the committee, because he has tried to apply the tolerances and specifications in Porto Rico and did apply them, and since has been working on a book of instructions.

Mr. DOWNING. I might also say that we have received valuable assistance from Mr. Bearce on the subject of graduates. He has helped in editing and in the compiling of the tables. Mr. Bearce visited Wisconsin and conferred in this matter with me and then took it up directly with the other members of the committee.

REPORT OF THE COMMITTEE ON TOLERANCES AND SPECIFICATIONS.[1]

Your committee on tolerances and specifications respectfully submits the following report:

For some time past there has been a demand from some of the States for tolerances and specifications for glass graduates and prescription scales, since these States have already included in their work the inspection of these classes of apparatus or are awaiting the issuance of tolerances and specifications in order that such work may be begun. Your committee, therefore, has held a number of meetings during the past year and has consulted with the various manufacturers and with some of the weights and measures officials most directly concerned. Having in mind the suggestions received and the results of the investigations conducted, your committee has drafted a set of specifications and tolerances for these two classes of apparatus.

At the meetings of the committee other criticisms and suggestions made with reference to the specifications and tolerances adopted last year have received consideration. The majority of these suggestions and criticisms were believed not to be well taken, but a few amendments were agreed upon by your committee.

These new tolerances and specifications and the amendments to the old report were incorporated in the advance report of the committee which was sent out May 3 to all State officials, delegates, and persons attending the conference last year, and to all manufacturers. These reports were accompanied by the following letters of transmittal:

MAY 4, 1916.

To State Sealers:

DEAR SIR: There was forwarded to you yesterday an advance copy of the report of the committee on tolerances and specifications which will be presented to the Eleventh Annual Conference on Weights and Measures of the United States, together with a copy of the tolerances and specifications in their present form as adopted by the tenth annual conference.

The committee will recommend that these new tolerances and specifications be adopted to take effect as in the case of the former report; that is, only those most urgently needed for the prohibition of actual fraud should be made retroactive, while all others should not be made retroactive in their effect, but should be limited to apply only to apparatus brought into or manufactured in a jurisdiction after their promulgation. The committee will make specific recommendations as to this classification in a supplemental report to be presented to the conference with the advance report. It is also probable that the committee will recommend that none of the amendments to the specifications take effect before a definite future date so that any necessary changes in construction may be made by the manufacturers without hardship to them.

The main additions consist of tolerances and specifications for glass graduates and for prescription scales, which classes of apparatus are included for the first time. These are urgently needed in a number of States which have already inaugurated an inspection service of this apparatus and will become

[1] The tolerances and specifications as adopted will be found in Appendix 1.

of more and more service as additional States take up this class of work. The remaining additions are largely devoted to the broadening of the application of some of the specifications which have heretofore been limited to apply only to special types. The changes in the old specifications are in the main slight ones, since the experience of several years has now developed a set of specifications and tolerances which meet the requirements of trade throughout the country.

You are requested to consider this advance report carefully and inform yourself as to the additions and amendments proposed, to the end that you may be prepared to take such action as you may deem advisable and proper when the report comes before the conference for action thereon. If you desire to submit any written suggestions or criticisms to the committee before the conference convenes, we will be very pleased indeed to receive and consider them and, if any such suggestions or criticisms appear to be well taken, appropriate changes or amendments will be recommended to the conference by the committee. In order that proper time may be given for consideration it is suggested that such matter be submitted as soon as possible, and in any event it should be received not later than Friday, May 19.

Please bring with you the reports sent you yesterday.

Respectfully,

LOUIS A. FISCHER,
Chairman, Committee on Tolerances and Specifications.

MAY 4, 1916.

To Delegates to the Eleventh Annual Conference on the Weights and Measures of the United States.

DEAR SIR: We are inclosing herewith an advance copy of the report of the committee on tolerances and specifications which will be presented to the Eleventh Annual Conference on Weights and Measures of the United States, to be held in Washington, D. C., May 23–26, 1916.

The committee will recommend that these new tolerances and specifications be adopted to take effect as in the case of the former report; that is, only those most urgently needed for the prohibition of actual fraud should be made retroactive, while all others should not be retroactive in their effect, but should be limited to apply only to apparatus brought into or manufactured in a jurisdiction after their promulgation. The committee will make specific recommendations as to this classification in a supplemental report to be presented to the conference with the advance report. It is also probable that the committee will make a general recommendation that none of the amendments take effect before a definite future date, so that any necessary changes in construction may be made by the manufacturers without hardship to them.

The main additions are tolerances and specifications for glass graduates and for prescription scales, which classes of apparatus are included for the first time. The remaining additions are largely devoted to the broadening of the application of some of the specifications which have heretofore been limited to apply only to special types. The changes in old specifications are in the main slight ones, since the experience of several years has now developed a set of specifications and tolerances which meet the requirements of trade throughout the country.

Delegates are requested to consider this advance report carefully and inform themselves as to the additions and amendments proposed, so that they may come to a conclusion as to their advisability. If you desire to submit any written suggestions or criticisms to the committee before the conference convenes, we will be very pleased indeed to receive and consider them; and if any such suggestions or criticisms appear to be well taken, appropriate changes or amendments will be recommended to the conference by the committee. In order that proper time may be given for consideration, it is suggested that such matter be submitted as soon as possible, and in any event it should be received not later than Friday, May 19.

Please bring the inclosure with you.

Respectfully yours,

LOUIS A. FISCHER,
Chairman, Committee on Tolerances and Specifications.

MAY 2, 1916.

To Manufacturers of Weights and Measures and Weighing and Measuring Devices.

GENTLEMEN: We are inclosing herewith an advance report of the committee on tolerances and specifications which will be presented to the Eleventh Annual Conference on the Weights and Measures of the United States, to be held in Washington, D. C., May 23–26, 1916. There is also inclosed a copy of the tolerances and specifications in their present form, as adopted by the tenth annual conference.

The committee will recommend that these new tolerances and specifications be adopted, to take effect as in the case of the former report; that is, only those most urgently needed for the prohibition of actual fraud should be made retroactive, while all others should not be retroactive in their effect, but should be limited to apply only to apparatus brought into or manufactured in a jurisdiction after their promulgation. The committee will make recommendations as to this classification in a supplemental report to be presented to the conference with the advanced report. It is also probable that the committee will make a recommendation that none of the amendments take effect before a definite future date, so that any necessary changes in construction may be made without hardship.

This report will be of main interest to manufacturers of glass graduates and of prescription scales since these classes of apparatus are included for the first time. However, other manufacturers will be interested in the additions and in the changes which affect their products. The additions are mainly in the broadening of the application of some of the specifications which heretofore have been limited to apply only to special types. The changes are, in the main, slight ones, since the experience of several years' enforcement has now developed a set of specifications and tolerances which meet the requirements of trade throughout the country.

You are requested to consider this advance report carefully and, if you so desire, to make any written suggestions or criticisms to the chairman of the committee. The committee will be pleased to receive them and to give them consideration, and if any such criticisms or suggestions appear to be well taken, appropriate changes will be recommended to the conference. In order that proper time may be given for consideration, it is advisable that such matter be submitted as soon as possible and, in any event, not later than Friday, May 19.

A half day will be set aside at the conference for manufacturers, and this time will be equally apportioned among those manufacturers signifying their desire to address the conference on the subject of tolerances and specifications, or on any other subject of interest to the delegates. The time allowed to each manufacturer must necessarily depend upon the number of those desiring to be heard.

If you desire additional copies of inclosures, they will be furnished upon request.

Respectfully,

LOUIS A. FISCHER,
Chairman, Committee on Tolerances and Specifications.

It will be noted that suggestions and criticisms were invited by the committee. A number of these have been received and have been carefully considered. As a result your committee has drafted and respectfully recommends the amendments and additions to the advance report which have already been distributed.

Respectfully submitted.

LOUIS A. FISCHER,
J. C. CONNORS,
F. P. DOWNING,
Committee on Tolerances and Specifications.

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DISCUSSION.

Mr. REICHMANN. I desire to make a suggestion that we take the advance copy of the report up first in connection with the amendments and take them up subject by subject. In other words, I see here No. IV, "Liquid capacity measures." Why can we not expedite the matter by taking up the whole of that subject? Some of the subjects are not particularly new and some of them are particularly faulty; some have points that are particularly vicious, and I think we should take them up by subject matter instead of paragraph by paragraph, and in that way save time, as everyone has the tolerances and specifications before him.

The CHAIRMAN. If there is no objection they will be taken up subject by subject. There are not many paragraphs underneath subjects, and it could be handled more quickly in that way. If there is no objection we will proceed with the first subject.

LIQUID CAPACITY MEASURES.

Mr. CONNORS. At a former meeting the committee recommended, and the conference adopted, specification No. 1, relating to the material to be used in the manufacture of liquid capacity measures. To clarify that subject we recommend the following:

Amend by adding thereto the following words:

"*Provided, however*, That when the measure is made of iron or steel, or iron or steel plated with tin, zinc, or copper, or is made of copper, the minimum thicknesses of the metal shall in no case be less than those given in the following table:

Capacity of measure.	Minimum thickness if of iron or steel or of plated iron or steel.	Minimum thickness if of copper.
	Inch.	*Inch.*
Over 1 gallon	0.016	0.032
1 gallon	.014	.028
½ gallon	.014	.028
1 quart	.014	.028
1 pint or less	.010	0.020

The following commercial tin plates will comply with these requirements: Over 1 gallon, 2XL; 1 gallon, ½ gallon, and 1 quart, 1X; 1 pint or less, 1CL.

The specification will then read as follows:

1. Liquid measures shall be made of metal, glass, earthenware, enameled ware, composition, or similar and suitable material, and shall be of sufficient strength and rigidity to withstand ordinary usage without becoming bent, indented, distorted, or otherwise damaged: *Provided, however*, That when the measure is made of iron or steel, or iron or steel plated with tin, zinc, or copper, or is made of copper, the minimum thicknesses of the metal shall in no case be less than those given in the following table. (See table above.)

We also recommend that that specification should not be made retroactive on account of the large number of measures in use at the present time which are not of the required minimum thickness.

The CHAIRMAN. This first subject as I see it relates almost entirely to the thickness of material, a matter of which most of us can have very little knowledge. I presume you have measured this from

standard measures, and unless there is some objection we might pass on. Has anyone any objection to this particular amendment?

Mr. REICHMANN. I have a suggestion that when this is printed these particular thicknesses of metal and also the approximate number of the metal gauge be given for the benefit of the manufacturer.

The CHAIRMAN. You had better keep away from metal gauges if you can unless you will specify the gauge.

Mr. REICHMANN. Specify some gauge—I do not know which one it is. Most of the manufacturers of metals talk about some particular gauge, and they do not know anything about the thickness of metals.

The CHAIRMAN. The trouble is that copper is of one gauge and steel of another. There we are liable to get into confusion. But if there is any one gauge which will apply here, and I could not tell you offhand whether the Brown-Sharpe gauge applies, I would say put it in.

Mr. HOLBROOK. How about the note which states, "The following commercial tin plates will comply with these requirements," and which then gives the commercial symbols?

Mr. REICHMANN. I suppose that will do. I merely raised the point because some one suggested that to me last night.

Mr. SWEENEY (of Boston). I have to admit I do not know a great deal about this and I rise for information. Possibly my question may seem foolish, but if it is I hope you will forgive me for taking up the time of the convention. I see in the first section it says:

> Liquid measures shall be made of metal, glass, earthenware, enameled ware, composition, or similar and suitable material, and shall be of sufficient strength and rigidity to withstand ordinary usage without becoming bent, indented, distorted, or otherwise damaged.

I do not see any mention of the strength.

Mr. DOWNING. That has been taken care of by this very table.

The CHAIRMAN. The thickness covers that.

Mr. SWEENEY (of Boston). That table mentions iron or steel. What are some of the cheaper measures made of?

Mr. DOWNING. They are all made of steel coated with tin, and they are considered steel with a tin coating.

The CHAIRMAN. The point was very well made if the table did not follow, but the table covers that case and covers all of the metals from which these measures are made unless it is brass. I do not see brass, and perhaps that should be added.

The SECRETARY. No. They are mostly made out of tinned sheet metal or copper, but there is no reason why we could not include brass. We would not object to brass being used, but we do not know of any such measures.

The CHAIRMAN. Brass is more common as a sheet metal than copper.

The SECRETARY. Not for commercial measures. There is no objection to it that I can see.

The CHAIRMAN. Are there any remarks?

Mr. DUSSEAULT. Do I understand, Mr. Chairman, that that applies to the fiber measure such as they use in grocery stores?

Mr. CONNORS. That is taken care of by the word "composition" in the original specifications.

The CHAIRMAN. Are they considered reliable for liquids?

Mr. CONNORS. Yes. There are fiber measures on the market used mostly for vinegar that are of thick paper fiber. The acid of the vinegar will attack metal. Fiber measures are considered by the sealers as a very good measure so far as I know.

Mr. JOHNSON. Is it the consensus of opinion that each specification should be disposed of as we come to it?

The CHAIRMAN. I understand so.

The SECRETARY. I think that would be the best way.

The CHAIRMAN. If the subject is agreed to, all right; if it is not, this is the best time to discuss it.

Mr. JOHNSON. I move the adoption of specification No. 1, under the head of "Liquid capacity measures."

(The motion was seconded and agreed to.)

Mr. CONNORS. The next specifications are on the subject of glass graduates.

Before the subhead "Measuring pumps" add a new subhead with specifications and tolerances to read as follows:

GLASS GRADUATES.

Specifications.—1. Graduates shall be made to contain or to deliver the indicated volume at 20° C. (68° F.). They shall be legibly, conspicuously, and permanently marked to indicate whether they are graduated to contain or to deliver.

2. Graduates shall be either cylindrical or conical in shape. In the case of all cylindrical graduates the ratio of length of the graduated scale to the internal diameter shall not be less than 5 to 1. In the case of conical graduates the ratio of length of the graduated scale to the internal diameter at the highest graduation shall not be less than 2 to 1, and at one-fourth of the total capacity this ratio shall not be less than 1 to 1.

3. Graduates shall be made of good-quality glass, thoroughly annealed, clear, transparent, of uniform but not excessive thickness, and free from bubbles and streaks.

4. Graduates shall be provided with a base at right angles to the axis and of such a diameter that the graduate will stand when placed on a surface making an angle of 25 per cent, or approximately 15 degrees, with the horizontal.

5. All graduates shall be provided with lips.

6. The graduation marks shall be perpendicular to the axis and parallel to the base and to each other.

7. The graduation marks shall be varied in length in such a manner that they may be conveniently read, but in no case shall any graduation mark extend less than one-fourth of the distance around the graduate. The main graduation marks shall extend at least one-half of the distance around the graduate: *Provided, however,* That on duplex or double scale graduates a clear space shall be left between the ends of the main graduation marks on the two scales, and this space, measured parallel to the graduation marks, shall conform to the following values:

Circumference of graduate at the graduation marks.	Distance between ends of graduation marks.
	Inch.
Up to 5 inches	1/8
From 5 inches to 10 inches inclusive	1/4
More than 10 inches	3/8

8. Graduation marks shall be clear and distinct and uniform in character. They shall be etched or engraved and shall not exceed 0.015 inch (0.38 mm.) in width. Blown or pressed graduation marks shall not be allowed.

9. The clear interval between the graduation marks shall not be less than 0.04 inch (1 mm.).

10. The value of the main graduation marks shall be plainly designated, each number being placed either directly upon or immediately above the graduation mark to which it refers, but the position of the numbers shall be consistent throughout the graduated scale. If placed upon the graduation marks the numbers shall be placed from the ends a sufficient distance to allow the ends to be used in making a setting. Intermediate graduation marks shall not be numbered.

11. On all single scale graduates where the main graduation marks do not completely encircle the graduate, the middle points of the main graduation marks shall be directly opposite the lip. On duplex or double-scale graduates the center of the clear spaces between the ends of the main graduation marks, provided for in specification 7, shall be approximately 90 degrees from the lip.

Tolerances.—The tolerances to be allowed in excess or deficiency on glass graduates shall not be greater than the values given in the following table.

NOTE.—The tolerance to be used at any point on any graduate shall be determined by measuring the inside diameter of the graduate at the point under test, and taking from the table the tolerance value corresponding to this diameter.

Tolerance for graduates of various diameters.

[In metric units.[1]]

Diameter.	Tolerance.	Diameter.	Tolerance.	Diameter.	Tolerance.	Diameter.	Tolerance.
Mm	*Ml*	*Mm*	*Ml*	*Mm*	*Ml*	*Mm*	*Ml*
10	0.04	33	0.55	56	1.9	79	4.4
11	.05	34	.60	57	2.0	80	4.5
12	.06	35	.60	58	2.0	81	4.6
13	.07	36	.65	59	2.1	82	4.8
14	.08	37	.70	60	2.2	83	4.9
15	.09	38	.75	61	2.3	84	5.0
16	.10	39	.80	62	2.4	85	5.1
17	.12	40	.85	63	2.5	86	5.2
18	.14	41	.90	64	2.6	87	5.4
19	.16	42	.95	65	2.7	88	5.5
20	.18	43	1.00	66	2.8	89	5.6
21	.20	44	1.05	67	2.9	90	5.7
22	.22	45	1.10	68	3.0	91	5.9
23	.24	46	1.15	69	3.1	92	6.0
24	.26	47	1.25	70	3.2	93	6.1
25	.28	48	1.30	71	3.4	94	6.2
26	.30	49	1.35	72	3.5	95	6.4
27	.35	50	1.4	73	3.6	96	6.5
28	.35	51	1.5	74	3.7	97	6.6
29	.40	52	1.6	75	3.9	98	6.8
30	.45	53	1.6	76	4.0	99	6.9
31	.45	54	1.7	77	4.1	100	7.1
32	.50	55	1.8	78	4.2		

[1] The term "milliliter" or "ml" is used herein to designate the one-thousandth part of the liter. This unit is also commonly known as the cubic centimeter or the "cc." The latter is not an accurate usage as the units are not exactly equal, but the difference between them is of no consequence for the purposes of this table, and therefore they may be used interchangeably.

Tolerance for graduates of various diameters—Continued.

[In United States customary units.]

Diameter.		Toler-ance.	Diameter.		Tolerance.	
Inches.	Six-teenths.	Minims.	Inches.	Six-teenths.	Drams.	Minims.
.....	6	0.6	2	4	.....	32
.....	7	.8	2	5	.....	34
.....	8	1.0	2	6	.....	36
.....	9	1.3	2	7	.....	39
.....	10	1.6	2	8	.....	41
.....	11	2.0	2	9	.....	44
.....	12	2.5	2	10	.....	47
.....	13	3.0	2	11	.....	49
.....	14	3.5	2	12	.....	52
.....	15	4.0	2	13	.....	55
1	0	5	2	14	.....	58
1	1	6	2	15	1	2
1	2	6	3	0	1	5
1	3	7	3	1	1	8
1	4	8	3	2	1	12
1	5	9	3	3	1	15
1	6	10	3	4	1	18
1	7	11	3	5	1	21
1	8	12	3	6	1	24
1	9	14	3	7	1	27
1	10	15	3	8	1	31
1	11	16	3	9	1	34
1	12	17	3	10	1	38
1	13	19	3	11	1	41
1	14	21	3	12	1	44
1	15	22	3	13	1	47
2	0	24	3	14	1	51
2	1	26	3	15	1	55
2	2	28	4	0	2	0
2	3	30	.....	.....	.....	.....

The CHAIRMAN. If there is no objection, we will go at once to the discussion.

Mr. REICHMANN. Has the expert on glassware of the Bureau of Standards gone over these particular specifications and tolerances?

The SECRETARY. As Mr. Downing said a few moments ago, Mr. Bearce has been consulted on this.

Mr. REICHMANN. Then, Mr. Chairman, I move you that that section be adopted.

(The motion was seconded and agreed to.)

MILK BOTTLES.

Mr. CONNORS. This first amendment is to clarify specification No. 1 of the old tolerances and specifications which read—

Bottles used for the sale of milk or cream shall be made only in sizes heretofore specified under the heading, "Liquid capacity measures."

The committee recommends that there be added the words—

and they shall be made to contain their indicated capacities at a temperature of 68° F. (20° C.).

Mr. REICHMANN. Has this committee a letter of any kind from the Bottle Blowers' Association of the United States and Canada in any way approving of this milk-bottle specification? They are the people who have to make the bottles.

The CHAIRMAN. Has it been taken up with the manufacturers?

The SECRETARY. These specifications have been published for a couple of years and we have not heard of any complaints from the bottle manufacturers.

Mr. REICHMANN. That answers my question. I move you, sir, that that section be adopted.

The CHAIRMAN. Has the committee any other explanations to make?

Mr. CONNORS. No. The committee felt that milk bottles were tested at a temperature of 68°, the same as glass graduates.

Mr. REICHMANN. I would like to respectfully suggest when those temperatures are printed that we reverse them and say 20° C. and in parentheses 68° F., in order to be consistent with the bill which we have discussed.

(The motion was seconded and agreed to.)

Mr. JOHNSON. I am not at all opposed to the adoption of this specification, but while on the subject of milk bottles I want to remind you of the fact that California has taken a decided stand on specification No. 3, referring to the point to which the capacity should be measured. After a year of inspection work, wherein we have handled a million bottles or more, we find the Eastern manufacturers and the California manufacturers are making their bottles to contain or to approximate the contents within one-eighth of an inch of the cap-seat. They have substantiated their contentions to me on many occasions that when a bottle is filled to within one-quarter of an inch below the cap-seat churning of the milk in the bottle is permitted. Mr. Hanson informs me they have the capacity fixed in Massachusetts up to the cap-seat. All of the bottle-filling machines in common use can not fill to the cap-seat, but they all fill to within approximately one-eighth of an inch of the cap-seat—not one-quarter of an inch—and you will find upon inspection that the statement I am making is verified by facts in every instance.

I simply want to make a record of that contention here, and we eventually will substantiate the practicability of changing the specifications from one-quarter to one-eighth of an inch. I would like to make that suggestion in the form of a motion.

To restate it, the amendment to the section that I desire to make is this: Instead of fixing the capacity at one-quarter inch below the cap-seat, fix it at one-eighth inch below the cap-seat on both sizes of bottles. I make that as a motion.

(The motion was seconded.)

The CHAIRMAN. It might be well to have discussion on this point. You have heard the motion seconded. Are there any remarks? We certainly ought not change the specifications without a thorough discussion and a statement of the reasons therefor.

Mr. REICHMANN. May I amend that motion by referring that section back to the committee for report next year? I think that is an important thing that ought to be taken up, and we should get the expression of opinion of the glass blowers' association of the United States and Canada as well as the glass bottle manufacturers, and if the practice in Massachusetts and California varies so widely, it seems to me it would be a simple matter to get a report from these States and get an equitable proposition. Mr. Johnson says he has documentary evidence which he can submit showing why they want

that. There is no particular hurry about passing this specification this year.

The SECRETARY. I might say it is not a question for the bottle maker, but it is a question of filling, as I understand it. The bottle maker may make his measures just as accurately whether the capacity is measured right up to the stopple or to a point one-quarter of an inch below it. The committee was of the opinion that one-quarter inch of space would have to be allowed, since it was believed that this was the point to which the bottle is filled in practice. But we want to be governed by facts. If it is better to have it a less distance and consider it full, we would be glad to amend the section.

Mr. REICHMANN. I take it that the general scheme is, of course, to have some specification that is equitable to all concerned, because there is no legal basis for all of these specifications. We can not enforce them unless we do that which is equitable and consistent with the best practice.

Mr. JOHNSON. Mr. Chairman, as the result of the inspection of milk bottles I believe that California has tested more milk bottles during the last year than perhaps any other State in the Union. All of the Eastern manufacturers of bottles who sell bottles in California comply with the specifications as adopted there, and we have adopted the one-eighth inch below the cap-seat. I have had interviews with the manufacturers of various kinds of machinery built to fill milk bottles. In California, which is conceded to be one of the farming States in the Union particularly adapted to dairying, I have gone through approximately 10 of our largest dairies and inspected thousands of filled bottles, and in no instance have we found a bottle only filled to within one-quarter of an inch below the cap-seat. They have been filled to within one-eighth of an inch as the minimum, and from that up to the stopple. We adopted a one-eighth inch maximum below the cap-seat or stopple, and we have obtained uniform and universal cooperation both with the dairies and the bottle manufacturers. It is perfectly satisfactory, and at the last session the only person who opposed my contention here in the conference was the local sealer of Washington, and as the report of the conference will prove, there is not a substantial argument in his contention to sustain his opinion. I was overruled, I presume, as a matter of expediency.

From a practical point of view you will find my contentions are not based alone on my personal observation, but as a result of careful gathering of data from many places. You will find that one-eighth inch below the cap-seat is sufficient space to allow for the bubbling of the milk and not enough to permit the churning of the milk, and it is satisfactory to the dairy and creamery interests. I do not want this to confuse the adoption of these specifications. I do not want these specifications to be returned to the committee. I would rather withdraw my motion. If necessary, let us adopt the specifications and defer my contention until next year.

Mr. SWEENEY (of Boston). Mr. Chairman, it strikes me that we are spending time needlessly on this question. It seems to me if these tolerances are going to be adopted by the National Bureau of Standards, and they are recommended for adoption in the various States, then if California sees fit to adopt a specification requiring the measurement to be made at a point one-eighth of an inch below the cap or

stopple, that is all right. They are not going below the one-quarter inch prescribed in your tolerances, and it strikes me no harm is done. If some one adopted a half-inch, or something in excess of the quarter-inch, there would be reasonable cause for us to stop and object, but where the tolerance they are accepting is less than that which you are establishing, I think it would be useless to waste time on the subject.

Mr. JOHNSON. I do not think Mr. Sweeney realizes the importance of my contention. California is not a manufacturer of glass bottles, and these specifications, as adopted, are followed by Eastern manufacturers. However, they in their practical judgment have seen wise to accept one-eighth tolerance instead of the one-quarter. I do not want to have to apologize for taking up this time, as I think this is the proper forum to discuss these matters so that we can obtain a practical working understanding, and if I can demonstrate the fact that the conference at a prior year has taken the matter up I do not think it unwise to take the matter up at this time.

The SECRETARY. Some one made a suggestion that this amendment be passed, and that the committee investigate and report next year. It seems to me that is the best way to handle this subject. The committee will promise Mr. Johnson that a thorough investigation will be made. If his contention is right, I would be glad to make a recommendation next year that the distance be changed.

Mr. JOUNSON. Then I will withdraw my motion.

Mr. REICHMANN. I offer an amendment to your motion that this be left to the next conference.

Mr. JOHNSON. I accept that.

Mr. REICHMANN. The reason for the confusion on this whole milk-bottle proposition is that it is not an instrumental subject, but concerns the way the bottles should be filled, which is decidedly different. Some of the States, like Massachusetts and New York, require that they be measured to the cap-seat or stopple for the purpose of certifying accuracy.

The CHAIRMAN. Do you accept the amendment?

Mr. JOHNSON. Yes, sir.

The CHAIRMAN. Are you ready for the motion as amended? It refers this particular point on specification No. 3 to the committee for report next year. All those in favor say "aye," contrary "no." The motion is carried.

DRY CAPACITY MEASURES.

Mr. CONNORS. The next amendment relates to dry capacity measures. It reads as follows:

> Page 8, specification 6. Amend by adding thereto the following words:
> "All metal dry measures shall be adequately reinforced around the top."

Mr. DEAUSSAULT. Mr. Chairman, I move that the specification be adopted.

(The motion was seconded and agreed to.)

SCALES.

Mr. CONNORS. The next section includes amendments to the specifications under the heading "Scales, general specifications."

The CHAIRMAN. The subject here is scales, general specifications. We take up the whole subject, but the discussion, of course, will have to be by sections because the sections are on different points.

Mr. CONNORS. The first proposed amendment reads:

Add a new retroactive specification to each type of scale mentioned in the subheads under this title to be properly numbered and to read as follows:

"When not modified by the above, the specifications given under the heading 'Scales, general specifications,' shall apply to these scales in so far as they are applicable."

The SECRETARY. This amendment before you now merely states and calls attention to the fact that in so far as general specifications are not modified by the special ones under each class that the general ones shall apply to each class of scales. Nobody has any objection to that as this has always been intended. It is just common sense. It simply brings the attention of sealers to the fact that they must look at the general specifications when reading the special ones.

Mr. CONNORS. The next proposed amendment reads as follows:

Add a new retroactive specification to be numbered 2–a and to read as follows:

"2–a. No scale shall be used in weighing loads greater than its nominal or rated capacity."

Mr. REICHMANN. Mr. Chairman, it is perfectly obvious that no one but a fool would so use a scale, but if I want to buy a scale with a capacity of 10 pounds, and then put 100 pounds on it, I do not think it is anybody's business but mine, so far as that is concerned. This is a regulation as to the use of the scale.

The SECRETARY. I might state that I think Dr. Reichmann's contention in that particular case is pretty well taken. I think in these specifications we have really injected a new proposition which is more or less in the nature of a guide to the sealer. I think it can be defended as a regulation.

Mr. REICHMANN. The time is coming when we will have regulations outside of the strict questions of specifications and tolerances. There is no objection to having it in or to leaving it out, but if it is put out from the conference, intelligent and thinking people will say, "They want to cover everything and have become confused." It is simply to preserve the dignity of the bureau and the national conference that I raise that point.

Mr. CONNORS. There seemed to be no doubt in the mind of the committee as to the necessity for this specification or regulation if you wish to call it that. Suppose a scale is marked 50 pounds capacity, and the sealer tests it to this capacity and the scale is correct for 50 pounds. It does not seem proper that that scale should be allowed to be used for 75 pounds when tested only to 50 pounds. Anything might happen when a load of 75 pounds is placed upon it—for instance, the levers might bend, torsion might come into the frame, or one hundred and one things might happen that would result in inaccuracies.

It seemed to the committee that the regulation, or specification, as we call it, was necessary, and I think almost every sealer will admit that it is necessary. Whether you call it a specification or regulation, we make regulations or specifications for other types of scales. For instance, in some parts of the specifications we say that the maximum graduation shall be of 1 ounce upon a scale used in making a sale of

food at retail. I would like to hear the views of some of the sealers on that before we let it go.

Mr. CLUETT. Would it not be better in this instance to make that a sort of advisory measure, and say that no scale should be used for weighing loads greater than the nominal rated capacity?

The SECRETARY. I think as a regulation it is perfectly proper to say that a scale should not be so used. I think Mr. Connors's argument for that as a regulation is very good. We have found in our investigation of railroad-track scales that they may be tested and found to be correct for one capacity and utterly fail when used at a higher capacity.

Mr. HANSON. We might just as well take out the word "used" and say no scale shall be "tested." I think there is just as much sense in one as in the other.

The SECRETARY. That would be a perfectly proper regulation also. The sealer should not test beyond capacity.

Mr. HANSON. Do you not think he should know enough not to test beyond capacity?

The SECRETARY. I would not say they are tested, but I will say they are used beyond the rated capacity and by very intelligent people, too. They are used beyond their rating capacity right along. I do not think it is a matter of importance whether it is struck out or not.

Mr. HOWE. From a practical view of inspection of scales, I think that is absolutely necessary. If we take a 400-pound scale and weigh an 800-pound load on it, we often find the scale will bind, and that often occurs in junk shops where the man piles too much on it. He is then getting more than he is paying for. I think that is a most important regulation.

Mr. REICHMANN. I move that the specification be adopted.

(The motion was seconded and agreed to.)

Mr. CONNORS. The next recommendation is on the same page and reads:

Add a new retroactive specification to be numbered 3–a and to read as follows:

"The construction of all scales shall be such that when the beam is displaced to the full extent allowed by the construction of the scale it will return to its normal position."

The reason for that specification is that there are quite a number of scales on the market—mostly of the cheaper grades—so constructed that when the beam is displaced from one side to the other it gets out of balance and stays there. Most of the sealers have seen platform scales with the beam rubbing along the side of the trig loop, creating binding and throwing it out of balance. You have also seen some counter platform scales with a side motion of the beam, and it is hard to keep them in balance. The loops may take a different position, which would throw the scale out of balance. We do not specify the means of eliminating such conditions, but we specify that this condition shall not obtain. This is thought to be a good specification and a fair one.

The CHAIRMAN. You have heard the last section. Is there a motion in regard to that?

The SECRETARY. I would suggest, Mr. Chairman, that if there is no objection suggested to any proposed amendment that we assume

there is none and go right along. I think we lose a lot of time in waiting for some one to make a motion.

The CHAIRMAN. If there is no objection, this will stand approved.

Mr. CONNORS. The next specification is in the advance report:

No scale having a platform or plate upon which commodities might be weighed shall be equipped with a removable scoop designed or constructed to be set upon such plate or platform unless the scale is also equipped with a permanently attached device which will counterbalance or otherwise compensate for the weight of such scoop, and in the latter case this device shall clearly indicate on the customer's side of the scale whether the scoop should be on or off the scale. In no case shall any scale equipped with a removable poise or removable weight intended to counterbalance or otherwise compensate for the weight of a scoop be used.

The question came up during the past year whether the specifications forbid the use of the scales known commonly as the family type of scoop-on and scoop-off scales; that is, a scale with a platform above the beam and dial and a scoop that is removable. The usual way of using such a scale is to have it set at zero with the scoop off, then to fill the scoop and put it on, thereby short weighting the customer the weight of the scoop. The committee found that there was a great deal of doubt about the present specification, and so recommended this amended specification, which takes care of it.

Mr. JOHNSON. I move the adoption of the specification.

(The motion was seconded.)

Mr. SEARLE. If I am in order, I would like to inquire if that paragraph as it reads is not a regulation preventing the use of a scoop on any platform scale?

Mr. CONNORS. No. That does not prevent the use of a scoop on any platform scale, because the wording is, "equipped with a removable poise or removable weight." A counter platform scale may be equipped with a scoop, provided the weight used to counterbalance the weight of the scoop is not removable. For instance, a scale commonly known as a platform scale with a latch poise—that is, one that may be turned over to counterbalance the weight of the scoop—is a proper one provided that scale has on the customer's side a device indicating whether the scoop is on or off the scale. This specification does not prevent the use of that scale.

Mr. SEARLE. Then I think it is unfortunately expressed, because, if I read correctly, "No scale having a platform or plate upon which commodities might be weighed shall be equipped with a removable scoop designed or constructed to be set upon such plate or platform unless the scale is also equipped with a permanently attached device which will counterbalance or otherwise compensate for the weight of such scoop, and in the latter case this device shall clearly indicate on the customer's side of the scale whether the scoop should be on or off of the scale."

That would prevent a groceryman putting a scoop full of sugar on a platform counter scale.

Mr. CONNORS. Unless on the scale there was "a permanently attached device which will counterbalance or otherwise compensate for the weight of the scoop."

Mr. GUARDIA. Some of the spring-scale manufacturers have in mind and propose putting out this coming year a new type of so-called household scale. I have here, if you will permit me, a little cut of the machine we have.

The CHAIRMAN. You are speaking to this particular point?

Mr. GUARDIA. Yes, sir. This is a hanging scale with a base that rests on the table or on the floor. The hanging scale is attached to the support by a hook. Everything meets the specification of the conference. We have here a plate that the scoop rests on. The idea of adding this scoop is that in country districts the farmer, in putting up preserves and things of that kind, has to have a scoop to weigh the commodities in. This scoop rests on this platform. We think this type of scale will ultimately be the universal type of household scale. It is a hanging scale of family type, and what I would like to know is, in this ruling here, would this scoop be eliminated?

Mr. CONNORS. I should say it would. That is no different from the family scale with the scoop on top. You have a plate on which the commodity can be weighed and then you have a scoop which is to be placed upon the plate. We found the common practice was to set the scale at zero without the scoop, take the scoop to one side and fill it with the commodity, and then place it on the scale.

The CHAIRMAN. As I saw that picture, you did not expect to use it except as a scoop scale?

Mr. GUARDIA. As a scoop scale for household use.

The CHAIRMAN. How is it when it is off?

Mr. GUARDIA. A hanging scale. We have an adjusting bar that throws it back to zero after the scoop is put on.

Mr. MIKESELL. Is not the gentleman out of order? He is speaking distinctly of a household scale. What jurisdiction has the department over a household scale? Many of those scales, as I have found them, are labeled "Not legal in trade."

The CHAIRMAN. To have such a distinction is a bad plan.

Mr. GUARDIA. I said this morning that the spring-scale manufacturers had advanced further in the past year on spring scales than they have ever done before, and we are following closely all of the rules and regulations that the conference puts out, and I will safely say we can make spring scales to meet these specifications.

There is one point that I would like to have the conference take up, and that is the question of price of scales. If the men in the field can educate the public to the fact that they can not get a satisfactory weighing on a cheap scale, and then condemn that scale, you will have no trouble on spring scales. If you can educate your people to buy a better-class scale that will meet tolerances, I will assure you your inspectors will not have any trouble with spring scales.

Mr. MIKESELL. You all know it is impossible to educate all of the people, and the gentleman himself, representing his company, will probably admit that it is impossible to make a scale of that type, costing from 75 cents to $1.50, that will come within any tolerance of any State within the United States. I have never yet found one such scale, even when new and never removed from the box, that would come within the shift-test tolerance.

The CHAIRMAN. Several have called my attention to the fact that we are wandering away from the point, and I will ask you all to speak to the point under discussion; otherwise we will not get through.

Mr. GUARDIA. All I wanted was information as to the scoop.

Mr. CONNORS. In my opinion, Mr. Gardia, the scale which you showed in the illustration is nothing more or less than the scoop-on,

scoop-off scale of the ordinary family type, except that the pan is suspended instead of being over the spring; and I would say that, in my opinion, the specifications forbid the use of a scale of that character—that is, a scale which can be used with a scoop on and scoop off without any compensating device attached.

The CHAIRMAN. There is no objection to anyone registering their opinion in regard to this, but do not let us get off on to springs when talking about another subject. If there is no objection, this item will be passed.

Mr. WATSON. Suppose you have an equal arm balance with a scoop on one side and a ring on the other to balance that scoop, could not that ring be fastened to that scale and make it legal if it could not be taken off without a screw driver or a wrench? Would that pass?

Mr. CONNORS. I would say where the ring or flat weight on an even-arm scale is fastened permanently to a weight plate which can not be mistaken for a commodity plate that that scale would not be thrown out under the regulations. This regulation as it is, was passed in 1913 and has been in force three years. It is not a new specification. In these cases the sealer has at times had the scoop weight fastened to the counter poise or to the beam in order to make them comply with the specifications.

Mr. JOHNSON. There are a great many similar objections to these specifications, and rather than refer these back to next year we can refer them back for consideration to-morrow morning. I would suggest that instead of throwing out specifications entirely for another year, where there are substantial arguments in favor of a change, that we refer the specifications back to the committee for further deliberation and for further consideration to-morrow morning. Let us adopt the specifications subject to change to-morrow if necessary.

The CHAIRMAN. I must confess, with the last speaker, I would like to see the specific objections brought out in plain English and discussed on their merits. We are getting into a maze of details.

Mr. BARNARD. I would like to ask if it will be possible to enforce this specification. I took this particular matter up one time with our city attorney and asked if he thought we could successfully prosecute a man because he refused to comply with this specification. His opinion to me was that we could not, that the average jury would return a verdict of not guilty in a case of that kind, and I am wondering what use there is of passing a specification we can not enforce.

Mr. DOWNING. We have had two of these specifications in force in Wisconsin for several years and the specification is in force now. I had a large number of scales of the type that Mr. Deaussault, of Massachusetts, referred to. They have all been condemned. The policy that we followed was that where a merchant did not want to replace the old type with a new one, we allowed him to fasten down the weight and use the scoop on the scale. That is a common practice in our hardware stores, but a good many of the hardware men were dissatisfied and wanted new scales. I doubt whether you will find any scales in Wisconsin not in compliance with the former regula-

tion, and this regulation is to apply the same proposition to a spring scale of the family type.

There is no doubt in my mind but what the regulation is enforceable, because a scale of that type can be used for the perpetration of fraud, and we certainly have jurisdiction when it comes to making regulations.

Mr. MIKESELL. I move you that the section be accepted.

Mr. SWEENEY (of Boston). I would like to ask the gentleman who has presented these specifications a question. We have in the city of Boston, especially on some of the big fish wharves, men who use platform scales not equipped with tare beams, but they supply the scales with a homemade box, in some instances lined with zinc, in which to put the fish as a matter of convenience in weighing them. In some instances these men offset the tare of the box which they place upon the platform by the addition of a small weight to the counterpoise, which brings about a perfect equilibrium on the platform scale before the fish are placed in the box. Would that regulation prevent these men from using that type of box on a scale?

The SECRETARY. Can the box be put on and taken off?

Mr. SWEENEY. It is removable; yes.

The CHAIRMAN. What is the capacity of the scale?

Mr. SWEENEY. From 500 to 1,000 pounds.

Mr. CONNORS. I know the condition you speak of, and it is very common on the fish wharves to take these big zinc-lined boxes and put them on and make a weight to compensate for it. That is not a scoop within the meaning of the specification, and to my mind the specification would not prevent that.

Mr. FARRELL. I think that is mincing words. I think that is purely a scoop-on and scoop-off scale. It is a platform scale used with the scoop off and on. It is absolutely the same principle.

The CHAIRMAN. Do not let us go too far with this, but confine ourselves to the actual change in question.

Mr. CONNORS. I think that is in the same class with dump-freight scales, where they roll on freight and have a standard truck to put barrels on, and they have a separate weight that will counterbalance the weight of the truck, so that they can get a direct reading on the beam. They roll on the truck with a barrel of sugar and read directly, because they have a counterbalancing weight, and I think Mr. Sweeney's fish box would come in the same class.

Mr. BALLOU. The gentleman from Wisconsin has given a reason for this regulation. The same opportunity for fraud is given on the scale Mr. Sweeney speaks of, if the weight is left off the beam the box is not compensated for.

Mr. LINCOLN. We have to use common sense in all of these things. I live in a town where they deal in fish. These big boxes weigh 20 pounds or more, and the weight will be short by that amount. I do not think anyone will make a mistake along that line.

Mr. SWEENEY. I contend, and I suppose that it is the opinion of the majority of the men here to-day, that the intention of the gentleman who introduced this amendment was to prevent fraud, and if that is a fact some definition of what a scoop is must be presented to us before that is accepted. If this regulation went into

effect, we would be authorized by the State commissioner at some later period to go to these people and tell them to stop selling fish in this fashion.

The CHAIRMAN. Does the fishman take off this box and scoop up fish with it—does he use it as a scoop?

Mr. SWEENEY. No; they fork the fish into it.

The CHAIRMAN. Therefore it is a container, and not a scoop at all. I think it is a good thing to bring out these questions. I would suggest that the committee add a word or two defining the character of these scales. Evidently it was not intended to cover these large scales, and just a word in there will straighten the whole thing out.

The SECRETARY. I believe everybody understands what we mean by the word "scoop," but if we have not made it clear I am willing to have it referred back and have it made clear.

The CHAIRMAN. There is a motion before us to accept this.

Mr. REICHMANN. I want to amend the motion. If they go by the original specification, it will not delay matters particularly if we refer this back to the committee for report next year on this specific amendment. Substantially the same thing has been in the specifications before, so why would it not be simpler to delay final action in this proposition until next year? This is a more or less unimportant section.

(The motion was seconded.)

The CHAIRMAN. That is an amendment to the previous motion.

Mr. JOHNSON. I suggested a moment ago in the correction of these specifications that we can save time by referring these matters back to the committee for report to-morrow. A gentleman a moment ago informed us they were about to build a new scale of this type. Why delay our answer to these people for another year when we can give it to them to-morrow? I think we should refer this back to the committee to report to-morrow morning.

The SECRETARY. I object to that very much indeed. I want to say, in regard to making any changes here, that the committee have debated for a long time over the changing of one little sentence or a single word, and it is not quite as simple as Mr. Johnson thinks. You have to visualize all the possible types of scales that might be affected, and when you get the specifications drawn up, as we have in this case, we find that we never considered any such box. We thought that everybody would understand what we meant when we talked about a scoop. We have had this rather unusual view presented to us. We have to anticipate those things as much as we can, and I would not like to undertake to report anything back to-morrow morning without mature consideration.

Mr. REICHMANN. If we can get the report to-morrow morning, I am in favor of Mr. Johnson's suggestion.

The SECRETARY. I will say, Dr. Reichmann, that the committee will be unable to report on that by to-morrow.

The CHAIRMAN. The amendment is before us. The amendment is to carry this over and report next year. All in favor of the amendment say "aye," contrary "no."

(The amendment was agreed to.)

The CHAIRMAN. Those in favor of the original motion as amended please say "aye," contrary "no." The original motion is carried.

Mr. CONNORS. The next specification is on page 6 of the advance copy:

Page 11. Add two new specifications to be numbered "12–a" and "12–b," and to read as follows:

"12–a. The graduations on all beams and reading faces shall be clear and distinct, and in no case shall their width be less than 0.008 inch."

In the specifications for computing scales adopted by the conference the minimum thickness of the graduation was specified as 0.008 inch, and it seemed only fair to the committee that the conference should be advised of that fact and the specification adopted, providing that all beams and reading faces should have a graduation with a minimum width of 0.008 inch. There is no reason why it should apply especially to computing scales, but it should apply to all scales with reading faces.

Mr. FARRELL. I move the adoption of that.

The CHAIRMAN. If there is no objection, section 12–a will stand approved.

Mr. CONNORS. The next is 12–b [reading]:

The clear interval between the graduations on all beams shall not be less than 0.04 inch.

In the case of computing scales and spring scales you will find a specification adopted by the conference some years ago stating that the clear interval between graduations on all dials should not be less than 0.04 inch. The question came up last year, and the committee felt that the clear interval between graduations on all beams also should be not less than 0.04 inch. The clear interval between all graduations may not be less than 0.04 inch if this specification is adopted, since this makes the requirement apply to all scales.

The CHAIRMAN. If there is no objection, this will stand approved.

Mr. CONNORS. The next amendment is to specification No. 19, on page 11; and reads:

Strike out this specification and insert in lieu thereof the following:

"Reading edges or indicators of all poises shall be sharply defined, and all reading edges shall be parallel to the graduations on the beam: *Provided, however,* That all poises on graduated unnotched beams shall be so constructed that the immediate region, including at least one of the minimum weight graduations on both sides of the graduation indicated by the poise, are visible. The indicators of these poises shall be sharply defined and practically symmetrical to the graduations on the beam at the reading point. Reading edges on poises on graduated unnotched beams shall not be allowed."

Mr. REICHMANN. Last evening the secretary of the conference asked me about this particular specification. Unfortunately I had not seen this before. I want to say that this particular specification to my mind is impracticable because, in the first place, this same kind of poise was tried some 15 or 30 years ago and there are some in use on old scales still. I move you that this specification be not adopted.

(The motion was seconded.)

The SECRETARY. Mr. Chairman, I am certainly very surprised to learn, as I have recently, that the manufacturers regarded this as a very drastic change. To us here at the bureau who are in the habit of using symmetrical poises, and insist upon them, it seems a matter one would admit without argument; but apparently that is not the case. It is a fact, however, that any indicator that is symmetrical

with respect to a line is very much more accurately read. If you have a line or point meeting another line it is all right, but if you have an edge covering part of the line it is an extremely difficult matter to set it. If one graduation line is thicker than another you have to look at a similar line over here before you can estimate half of the one which is partly covered. I am talking about a poise that has the reading edge on it. A few months ago we got out some suggestions to the manufacturers along these lines and recommended that they follow them, and it was not until after we had received a large number of replies that we thought of incorporating that in our specifications. I might say that at the present time there is a poise of this style that is coming into very general use. I claim that that is an attempt to meet our recommendations. The point on the poise in the best ones I have seen is practically a straight line. Some of them are of other types which would not meet this specification, but there are poises of this kind, and there are going to be more and more of them. I do not think there is any question but what the symmetrical index lends itself to accuracy.

Mr. LINCOLN. Would that regulation do away with the poise on this type of scale here [indicating a scale]?

The SECRETARY. It would not do away with any of them that are already in use.

Mr. REICHMANN. Would it do away with any of those being made now? In other words, could a manufacturer of that scale continue making that poise, presuming you enforced the regulation?

The SECRETARY. I might state that the only reason that I did speak with Dr. Reichmann about this was because I thought he was one of the men who would get our point of view immediately.

Mr. REICHMANN. Many of you have undoubtedly seen poises like this [making a sketch on the board] that used to be made 15 or 20 years ago, where it had a beam like this [indicating], and a poise like this [indicating], with an opening and a wire or point over here, which made an ideal symmetrical proposition. This either joined it or came above it with graduations here. Such a poise I saw only last Friday in a plant in New Jersey, one of the most progressive concerns in the United States, used by people who are used to accurate work. It was on an old scale which used to be made. I believe some of them are still made. This particular scale had been in use there for 25 years, and the weighmaster who used it had weighed thousands of drums of chemicals. The only big kick he had on this scale was, as he called it, "That ——— fool poise." There is a practical proposition.

Theoretically I will agree with you if I had a beam like this [making a sketch on the board] and had a poise over here, and I was using it in a laboratory, I would prefer to have an index out here, with the fiducial line here and the graduations on the beam, so that I could make readings, one as against the other. But as a practical idea this would not be suitable, because the weighmaster would have this in a great deal worse shape than a poise like that.

The SECRETARY. There is one that has nothing but a wire.

Mr. REICHMANN. That type of poise is the most vicious that can be designed for use on any kind of scale except a postal scale, where it is used in the office. That wire would not last one day, and in the second place in the hands of any but the highest-priced weighmaster

he would read either to that wire or to this edge or to that edge [indicating].

Mr. Briggs. Mr. Chairman, would it be in order for me to give some of the results of practical experience on the form of poise here?

The Chairman. That is what we are looking for.

Mr. Reichmann. If the gentleman wishes to emphasize the point that my experience was not practical, I raise an objection.

The Chairman. Mr. Briggs wants to bring out some facts encountered in his experience.

Mr. Briggs. I think I can bring out some points in this matter. In the last year and a half I have personally tested somewhere between 70 and 80 scales of capacity of about 500 pounds of a type commonly used by the Post Office Department. In carrying out the provisions of the specifications it was necessary to apply tolerances to the poises. The poises in use were common poises, which were of this shape here [making a sketch on the board]. The tolerance on the beam was stated as a certain fraction of the graduation, which I do not pretend to carry in mind, but suffice it is to say, in attempting to apply the tolerances, the whole matter became absurd and was admitted to be so by the representative of the company with whom I was working. I could easily decide that these poises should belong in one position, and he would agree with me, and have to agree with me, that it was a fair proposition. He could place the poise in an entirely different position on the beam, and I would have to agree with him that that was an entirely possible setting of the poise. No doubt there are serious difficulties in introducing the symmetrical type of poises, but those are some of the difficulties you have at the present time with the present type of poise.

When you have a poise operating on a beam where it is located in definite positions by means of notches then the importance of this thing disappears, because the function of the pointer is merely to indicate the number on the beam. This question of the nonsymmetrical pointer brings out a question we have to contend with all the time in measuring. For instance, in our precision work, if we are reading on a micrometer and making settings on lines on a meter bar, the settings and readings are made by turning the micrometer head which moves two cross-hairs so that they are apparently equally spaced on either side of the line you are measuring. The object is to acquire precision, and it is necessary to get the thing as symmetrical as possible. When you come to using the nonsymmetrical pointer, no matter how sharp, you have to practically consider the personal equation, which is strongly emphasized in this type of poise. It does not really matter if you have an indicator which is of this type [making a sketch on the board] which has a very fine line down here. I have taken quite a number of words to express a fact which is probably to you self-evident.

Mr. Reichmann. Mr. Briggs raised a very great number of important points that I would like to elucidate, because these diagrams may not be clear. Let us get down to precision and let us analyze this. On most scales you will find graduations where the poise comes down to the graduations in this shape [making a sketch on the board]. There is your graduation. A man moves his poise to that point and he wants to read carefully; furthermore, the idea of most weighing is not the question of precision, but a question of com-

mercial accuracy, to accurately weigh within the least graduation, and the graduations are generally spaced far enough apart. One reason why this type of poise, which would absolutely comply with that specification, has been found objectionable and has been discarded by every weighmaster, is that it is hard to read because it always throws a shadow, and yet here you have a condition where you are reading to a symmetrical mark. I do not know of a scale that would not be practically thrown out.

Mr. FARRELL. Would the poise, such as suggested by Mr. Briggs, do away with the personal equation in weighing?

Mr. REICHMANN. Absolutely not.

The SECRETARY. I might say that poises in accordance with this specification would reduce it to a minimum. That is the real answer.

Mr. FARRELL. Is not that precision work?

The SECRETARY. I am saying that for practical work it is the same. The question Mr. Briggs discussed is of importance in determining tolerance. I think that Mr. Schlink has looked up these things for me and he knows what the practice is in other countries. We do not have all the experience and they none. It seems to me these people in Germany, England, and France do not make such specifications for nothing.

Mr. FARRELL. I have gone over the laws governing Germany, England, France, Italy, and Spain, and practically all the laws of Russia which have been translated, but I believe the American laws are good enough for America. We are entitled to the best, and I think we have the best. I found no country with laws better than ours.

The SECRETARY. Are you speaking of laws or of specifications?

Mr. FARRELL. Of specifications.

The SECRETARY. I am very glad to hear you say that.

Mr. FARRELL. Take our specifications, and especially if you take the New York State specifications, you will find them far in advance of any of the countries of which I have spoken.

Mr. SCHLINK. Dr. Reichmann intimated that certain manufacturers are prepared to go out of business rather than make this type of poise. It happens that we have on hand prints from practically every manufacturer in this country, to whom the matter has been offered, and it appears from a careful study of their letters that about one-third of the manufacturers protest the construction of this type of poise, but their objection is chiefly grounded on the cost of change of patterns, and another objection was that it would be impossible to replace a new poise on an old type of scale, which is of no point, since the specification is not retroactive. Two-thirds of the manufacturers approved of the idea and offered to put it into effect immediately, or as soon as their present stock of castings was exhausted, and in pursuance of that a number have submitted designs, many of which are satisfactory.

I would like to ask Dr. Reichmann whether he would like an automobile speedometer or steam gauge with a nonsymmetrical index?

Mr. REICHMANN. May I answer the gentleman on that point? There is no use answering that question, because I can not answer it.

Mr. SCHLINK. If you were to cover up this much of your dial on a speedometer [making a sketch on the board], and read on that edge, you would be merely obscuring a part of your reading face

and obtaining no benefit whatever. Steam gauges and automobile speedometers and practically every sort of engineering instrument use symmetrical indexes.

Mr. REICHMANN. I will answer the question by saying my room is 330, Raleigh Hotel, and I will be delighted to ask Mr. Schlink to come to dinner with me and I will be glad to stay up with him and discuss automobile speedometers and steam gauges until the wee small hours. I may have some ideas on the subject, but at the present juncture I think we are discussing a proposition of scales.

The CHAIRMAN. No. We are discussing the question of reading graduations.

Mr. REICHMANN. The specific specification is on a poise.

The CHAIRMAN. It has to do with the reading of graduations, and the gentleman simply presented other graduations as an illustration.

Mr. REICHMANN. I submit, Mr. Chairman, that the manufacturers want to cooperate with the bureau and the bureau wants the cooperation of the manufacturers. The letter which goes out from the manufacturer, as a rule, is written by some administrative officer of the concern, who applies a little soft soap and one thing and another. The gentlemen I have been talking to are not those people, but they are the superintendents of construction and the engineers and sales managers, and supposing that it will unquestionably cost a little more, who will have to pay the fiddler? The consumer and the sealer will have the greatest kind of diversity of apparatus in the field and he will have to determine whether that was from a casting which was cast or molded prior to April 1, 1916, or some such date.

It will be a hardship on the dealer; it is an impractical proposition from the weighmaster's standpoint; it is an enormous expense to the manufacturer, which he is going to charge to the consumer because the manufacturer is not going to lose.

The SECRETARY. Mr. Chairman, in view of all the dire consequences of this being adopted, as stated by Dr. Reichmann, I move that the specification be withdrawn.

The CHAIRMAN. There is a motion which has been seconded before.

The SECRETARY. Then I will amend any motion that has been made in order to do that. I think we can get the manufacturers to do it without the necessity of this action.

The CHAIRMAN. The matter is not, however, as difficult as it has been made out to be. It is a simple matter. In the first place, such a poise as this (indicating) should not be allowed because it covers up some graduations. I want to say a word on this question myself, that none should be allowed that come over the front of the beam and cut out figures thereon when it is so easy to avoid it. This metal can be cut away. If this represents a cross section of the beam (indicating), it is a very easy thing to have the poise so constructed that it does not go clear around it.

Mr. REICHMANN. I am sorry that I did not show a side view of it.

The CHAIRMAN. That bevel was cut off for that purpose.

Mr. SCHLINK. To answer that you need only put a bevel surface on the lower portion instead of on top.

The CHAIRMAN. A motion was made and seconded to strike out this amendment.

(The motion was carried.)

Mr. CONNORS. The next is on page 7 of the advance copy of report.

Mr. CONNORS. The next is on page 7 of the advance copy of report.

Add two new specifications to be numbered 23–a and 23–b, and to read as follows:

"23–a. All scales shall give correct weight indications whether the load is being increased or decreased."

The reason for the amendment is that all scales should give correct results, whether the load on the platform is increased or decreased, instead of having it apply to special types as it did before. We now make it a general specification and apply it to all scales. It is perfectly obvious if it applies to spring and computing scales, it should apply to all other scales.

Mr. BARNARD. Is there any tolerance on that?

Mr. CONNERS. The word "correct" is used; that is, it is to be accurate within the tolerance.

On page 7 of the advance report we find:

23–b. All devices intended to increase or decrease the capacity of a scale by the addition or subtraction of a weight or weights shall operate properly irrespective of the speed with which they are manipulated.

We place that in the general specifications in order to apply the specification to all scales.

The CHAIRMAN. You have heard these sections, and if there is no objection they will stand approved.

PLATFORM SCALES.

Mr. CONNORS. The next specification is under the heading of platform scales:

7–a. The maximum value of the minimum graduations of the graduated beams of counter platform scales used in the sale of foodstuffs at retail shall be 1 ounce: *Provided, however,* That this shall not apply to scales used exclusively in the sale of vegetables.

We already have that requirement under computing scales and under spring scales, and it seems fair that it should also be placed under counter platform scales to make it uniform throughout, that any scales used in the sale of foodstuffs at retail shall have a maximum value of graduation of 1 ounce.

The CHAIRMAN. If there is no objection this section will stand approved.

Mr. CONNORS (reading):

9–a. Counter platform scales whose weight indications are changed by an amount greater than one-half the tolerance allowed, when set in any position on a surface making an angle of 5 per cent, or approximately 3 degrees with the horizontal, shall be equipped with a device which will indicate when the scale is level, and in no case shall any pendulum operating the scale be considered a leveling device. The scale shall be rebalanced at zero each time its position is altered during this test.

That specification already relates to counter scales, spring scales, computing scales, cream-test scales, and prescription scales, and there is no reason why it should not apply to counter platform scales.

The CHAIRMAN. If there is no objection the section will stand approved.

Mr. CONNORS. This amendment is necessary to correct a typographical error in the report on tolerances and specifications adopted last year.

Page 15. Specification 12. Amend specification by making it nonretroactive.

This was a typographical error which crept into this report since the specification on counter scales, defining the minimum drop or fall, was made nonretroactive, and the specification relating to the drop or fall in the trig loop of platform scales was made retroactive. To correct this typhographical error we recommend the above.

Mr. REICHMANN. This is an inquiry for information. Retroactive means going backward, does it not?

The CHAIRMAN. That is what I understand.

Mr. REICHMANN. Nonretroactive means not going backward. That means going forward?

The CHAIRMAN. Yes, sir.

Mr. REICHMANN. Why does not this make it "effective" or "active"?

The CHAIRMAN. It is just a matter of the choice of English. If it is not retroactive, it is effective on the passage of this specification. That is a matter easily fixed. Is that your only objection?

Mr. REICHMANN. I am not objecting, but I was asking for information.

The CHAIRMAN. It may not be the best form of expression.

Mr. EGAN. I should think it meant nonretroactive in a legal sense, for the purpose of prosecution, that it would not apply to anything in existence.

Mr. CONNORS. That is the committee's idea, that where we say "nonretroactive" it does not apply to anything that may have been made up to the date of the specifications. After that date it will go in force.

Mr. REICHMANN. Mr. Chairman, I can not make myself clear and I withdraw my request for information.

The SECRETARY. There is no discussion here as to the meaning of the word "retroactive," is there?

The CHAIRMAN. No. The question was what is meant by the word "nonretroactive." If there is no further objection, this will stand approved.

Mr. JOHNSON. It is getting along toward 5 o'clock. Is there not some way we could expedite the approval of these specifications? We have given them careful study, and if there is no objection why not approve of the entire subject after reading the heading?

The CHAIRMAN. I think that is a good suggestion.

Mr. FARRELL. May I ask Mr. Johnson how long he has been studying these specifications?

Mr. JOHNSON. Approximately two weeks. I read mine two days on the train and I had them at the office for a couple of days.

Mr. HOLBROOK. I wish to state that copies of the specifications and of the advance report went forward from here on May 3 to all the members who attended the conference last year; to all State sealers; to all persons delegated to this conference; and to all manufacturers of weights and measures.

Mr. JOHNSON. I will make my former remarks as a motion.

(The motion was seconded and agreed to.)

COUNTER BALANCES AND SCALES.

Mr. CONNORS. The next amendment comes under "Counter balances and scales," and refers to a matter just discussed, and is simply for the purpose of harmonizing the specifications. It is as follows:

The maximum value of the minimum graduations of the graduated beams of counter scales used in the sale of foodstuffs at retail shall be 1 ounce: *Provided, however,* That this shall not apply to scales used exclusively in the sale of vegetables.

The CHAIRMAN. If there is no objection to the recommendation of the committee on the subject, it will stand as it is. That takes up all under the subject of counter balances and scales, beginning at the bottom of page 7 and ending about the middle of page 8. If there is no objection, we will pass to the next subject. We do not want to hurry you if you do not understand these matters. The next will be the subject of suspension scales of the lever type.

Mr. CONNORS (reading):

SUSPENSION SCALES OF THE LEVER TYPE.

Definition.—Amend by adding, in line 6, after the words "suspension creamery scales," the words "suspension pendulum scales." This definition will then read as follows:

"*Definition.*—Suspension scales of the lever type are lever scales designed and adapted to be hung from or attached to some support above and outside of the structure of the scale itself and which are not included within other classes herein defined. This class shall include steelyards, butchers' meat beams, suspension abattoir scales, crane scales, overhead tramway scales, suspension creamery scales, suspension pendulum scales, and the like."

Specifications and tolerances.—Amend this paragraph by adding thereto the following words:

"In the case of suspension scales equipped with an indicator and a reading face or dial such parts shall conform to all the specifications applicable to them given under the heading 'Spring scales,' except that the graduations are not required to be equally spaced."

The paragraph will then read as follows:

"*Specifications and tolerances.*—Suspension scales of the lever type having a capacity of more than 400 pounds shall be subject to the same specifications, in so far as these are applicable, and the same sensibility reciprocals and tolerances as platform scales. Suspension scales of the lever type having a capacity of 400 pounds or less shall be subject to the same specifications, in so far as these are applicable, and the same sensibility reciprocals and tolerances as counter scales. In the case of suspension scales equipped with an indicator and a reading face or dial, such parts shall conform to all the specifications applicable to them given under the heading 'Spring scales,' except that the graduations are not required to be equally spaced."

Mr. CONNORS. This adds the words "suspension pendulum scales." We had no class for the hanging scales of the pendulum type, and we wanted to make a class for them and put them under some definite subhead, so we include them in suspension scales of the lever type, which is the proper place.

The CHAIRMAN. There seems to be no objection, and the specification stands approved.

SPRING SCALES.

Mr. CONNORS. The next heading is "Spring scales," page 9, and, as it is short, I will read it:

Page 21, specification 2. Amend this specification by adding thereto the following words:

"and in no case shall their width be less than 0.008 inch."

The specification will then read as follows:

2. All graduations shall be clear and distinct and equally spaced, and in no case shall their width be less than 0.008 inch.

Mr. REICHMANN. For a point of information, I would like to ask if that beam scale we looked at just now on the counter would be classified as a computing scale? Under what classification does that scale come?

Mr. CONNORS. That comes under the classification of computing scales, and also counter scales. I am giving snap judgment, however.

Mr. REICHMANN. They would have to comply with all the specifications as to computing scales?

Mr. CONNORS. So far as the chart is concerned, yes. It would come under specifications for computing scales and counter scales in so far as they are applicable.

Mr. REICHMANN. It is either a computing scale or it is not.

Mr. CONNORS. Well, it is.

Mr. REICHMANN. That is all we want.

Mr. CONNORS. It also comes in under counter scales.

The CHAIRMAN. If there is no objection to the section on spring scales, it will stand approved. The next section refers to cream-test and butter-fat-test scales.

CREAM-TEST AND BUTTER-FAT-TEST SCALES.

Mr. CONNORS (reading):

Page 26. *Sensibility reciprocal.*—Amend by striking out in lines 2 and 3 the words "one-half grain or approximately 30 milligrams" and inserting in lieu thereof the words "1 grain or approximately 65 milligrams"; also by adding the following words thereto:

"*Provided, however*, That the manufacturers' maximum sensibility reciprocal or the maximum sensibility reciprocal on all new scales shall not be greater than one-half of this value. (The maximum load is defined as 18 grams multiplied by the number of bottles for which the scale is designed, plus the total tare of these bottles.)"

This paragraph will then read as follows:

"*Sensibility reciprocal.*—The maximum sensibility reciprocal allowable for these scales shall not exceed 1 grain, or approximately 65 milligrams, when the maximum load is placed upon the scale: *Provided, however*, That the manufacturers' maximum sensibility reciprocal or the maximum sensibility reciprocal on all new scales shall not be greater than one-half of this value. (The maximum load is defined as the weight of the sample used in each bottle multiplied by the number of bottles for which the scale is designed, plus the total tare of these bottles.)"

Page 26. *Tolerances.*—Amend by striking out in lines 2 and 3 the words "one-half grain, or approximately 30 milligrams," and inserting in lieu thereof the words "1 grain, or approximately 65 milligrams"; also by striking out in lines 3 and 4 the words "when the scale is loaded to capacity" and inserting in lieu thereof the following words:

"*Provided, however*, That the manufacturers' tolerance, or the tolerance to be allowed on all new scales, shall not be greater than one-half of this value.

"These tolerances shall be applied to single loads of 18 grams each, added successively until the maximum load as defined above is placed upon the scale."

The paragraph will then read as follows:

"*Tolerances.*—The tolerance to be allowed in excess or deficiency on all cream-test and butter-fat-test scales shall not be greater than 1 grain, or approximately 65 milligrams: *Provided, however*, That the manufacturers' tolerance, or the tolerance to be allowed on all new scales, shall not be greater than one-half of this value.

"These tolerances shall be applied to single loads of 18 grams each, added successively until the maximum load as defined above is placed upon the scale."

Mr. JOHNSON. I move the adoption of the section.

The CHAIRMAN. If there is no objection, the section will stand approved and we will pass to the next subject, "Prescription scales and balances."

Mr. CONNORS. This is an absolutely new subhead.

PRESCRIPTION SCALES AND BALANCES.

Definition.—Prescription scales and balances are scales and balances designed for or adapted to weighing the ingredients of medicinal and other formulas prescribed by physicians and others and entering into the ordinary trade of pharmacists and chemists, and which are used or intended to be used for such purpose.

Specifications.—1. All balances and scales shall be equipped with a device which will accurately indicate the position of equilibrium of the beam. If this device is provided with only one indicating edge, line, or point, then it shall also be provided with a graduated scale or arc. If this device consists of a scale or arc and a single indicating edge, line, or point, or of two indicating edges, lines, or points which move in opposite directions, these shall be so designed and constructed that when the beam vibrates one will oscillate with reference to the other.

2. Any graduated scale or arc similar to that referred to in specification 1, shall be divided into equal spaces with at least 0.04 inch clear interval between the graduations.

3. If the indicating device referred to in specification 1 is provided with a single indicating edge, line, or point, this shall reach to the graduated scale or arc and shall be designed and constructed to enable the readings to be made with precision. If provided with two indicating edges, lines, or points, these shall be sharply defined and shall in no case be more than 0.04 inch from each other when the scale is in balance, this space to be measured horizontally.

4. The distance between the graduated scale and the indicator shall in no case exceed 0.04 inch.

5. All knife edges and bearings shall be made of hardened and tempered steel or agate.

6. The graduations on all graduated beams shall be clear and distinct, and in no case shall their width be less than 0.008 inch.

7. The clear space between graduations on all graduated beams shall not be less than 0.04 inch.

8. All scales and balances shall be provided with a device for arresting the vibration of the beam.

9. All scales shall be so constructed and adjusted that when the beam is released or disturbed it will return to its original position of equilibrium.

10. All scales and balances whose weight indications are changed by an amount greater than one-half the tolerance allowed, when set in any position on a surface making an angle of 5 per cent or approximately 3° with the horizontal, shall be equipped with a device which will indicate when the scale is level, and in no case shall any pendulum operating the scale be considered a leveling device. The scale shall be rebalanced at zero each time its position is altered during this test.

11. For the purpose of applying the sensibility reciprocal and tolerances the capacity of all prescription scales and balances shall be taken to be 1 ounce.

Sensibility reciprocal.—The maximum sensibility reciprocal allowable for prescription scales and balances shall not exceed 0.2 grain, at the capacity or at any lesser load, with the exception that when this value is larger than that represented by two of the minimum graduations on any beam with which the scale may be equipped, the latter value shall be applied and used as the maximum sensibility reciprocal at the capacity or at any lesser load: *Provided, however,* That the manufacturers' sensibility reciprocal or the maximum sensibility reciprocal on all new prescription scales and balances shall be one-half of the value given unless this value is greater than one of the minimum graduations on the beam, in which case this latter value shall be applied and used as the maximum sensibility reciprocal.

(The term "sensibility reciprocal" means the weight required to move the position of equilibrium of the beam, pan, pointer, or other indicating device of a scale or balance a definite amount. In the case of scales provided with a

single indicator and a graduated scale or arc, one of which oscillates with reference to the other to form a convenient means for determining the position of equilibrium of the beam, and which does not of itself directly indicate in terms of weight, the sensibility reciprocal is the weight required to cause a change in the position of rest of the pointer equal to one division of the graduated scale or arc.

In the case of scales equipped with two indicators which move in opposite directions and oscillate with reference to each other to form a convenient means for determining the position of equilibrium of the beam, the sensibility reciprocal is the weight required to cause a separation of the indicators 0.04 inch.)

Tolerances.—The tolerance to be allowed in excess or deficiency on all prescription scales and balances shall not be greater than 0.4 grain or approximately 25 milligrams on the ratio of arms when the maximum capacity load of 1 ounce is placed upon each pan.

If the scale is equipped with a graduated beam, the tolerance at any graduation on the beam shall be equal to the actual sensibility reciprocal of the scale at the load in question.

Mr. JOHNSON. I move the adoption of this section.

(The motion was seconded and agreed to.)

Mr. CONNORS. The specification with regard to weights reads as follows:

WEIGHTS.

Page 26, specification 2. Amend by striking out the words "and no sharp points or corners" and inserting in lieu thereof the following words: "and no weight representing a value of more than 1 gram, 1 pennyweight, or 1 scruple shall have sharp points or corners."

The specification will then read as follows:

"2. Weights shall have smooth surfaces, and no weight representing a value of more than 1 gram, 1 pennyweight, or 1 scruple shall have sharp points or corners."

Page 27, specification 6. Amend by adding thereto the following words:

"*Provided, however,* That the values of weights of less than 1 gram, 1 pennyweight, or 1 scruple may be designated by dots, lines, figures, definite shape, or other appropriate means."

The specification will then read as follows:

"6. All weights shall be clearly marked with their nominal value, and in addition weights intended for use on multiplying lever scales shall be clearly marked with the value they represent when used upon the scale for which they are intended: *Provided, however,* That the values of weights of less than 1 gram, 1 pennyweight, or 1 scruple may be designated by dots, lines, figures, definite shape, or other appropriate means."

Mr. FARRELL. Do these specifications do away with coin weights?

Mr. CONNORS. No; they do not do away with coin weights. Under my interpretation they would allow the coin prescription weights, if that is what you mean.

The next change is to make retroactive that part which reads, "All weights shall be clearly marked with their nominal value."

Mr. WATSON. Mr. Chairman, the gentleman spoke of weights being marked. If you take a 1-pound weight, is it necessary to have the word "pound" on it, or may it just have "1" on it or "2" on it? You can not get it all on some of the weights.

Mr. CONNORS. I should say that when we specify that weights have their nominal value marked on them, I think that the figure 1 would designate to anyone that it is 1 pound and not 1 ounce, for instance.

The CHAIRMAN. If there is no objection, that section will stand approved.

DISCUSSION OF APPLICATION OF TOLERANCES AND SPECIFICATIONS.

Mr. CONNORS. The last recommendation the committee makes is that all tolerances and sensibility reciprocals go into effect at once, and that the specifications which are not retroactive go into effect January 1, 1917, in order to give the manufacturers a chance to change over what they have to change or what they may have to change.

The CHAIRMAN. You have heard the last suggestion, which is rather an important one, and I think we should give that serious consideration. That could be stated—that the specifications which are not retroactive take effect January 1, 1917.

Mr. REICHMANN. May I have explained the first paragraph of article 1?

The CHAIRMAN. Is that in reference to the present matter before us? If not, I have not put the motion in regard to that. You have heard the last suggestion of the committee, and if there is no objection that will stand approved.

Mr. REICHMANN. I have to ask for another point of information as to the section headed "I. Application of tolerances and specifications," in this printed form. I take it the section[1] means to apply only to commercial weighing devices used in trade—that is, used in the buying and selling of commodities.

The CHAIRMAN. I take it that it refers to all those you gentlemen inspect and seal. However, that is a personal opinion.

Mr. CONNORS. Mr. Chairman, that is a matter of law and not something we should discuss here.

Mr. REICHMANN. Mr. Chairman, that is a most extreme and vital question of importance to industrial concerns who use scales in their internal affairs. In some instances the weights and measures officials do not take cognizance of them for lack of time, lack of law, or for some other reason. I am assuming these only apply to scales used in commercial weighings.

Mr. CONNORS. This is a matter of law. In the city of New York they have an ordinance which says that all weights and measures instruments offered for sale in the city of New York must be approved by the mayor's bureau of weights and measures. In Massachusetts it is limited to scales used for buying and selling and public weighing. The conference has no jurisdiction over this matter. If the city of New York adopted these specifications, they would apply to all scales sold or used in the city of New York.

Mr. REICHMANN. I am very grateful to the member of the committee for giving an interpretation of the New York City ordinance, especially in the presence of the deputy commissioner. I would not venture to give an interpretation of that ordinance. I am perfectly serious in my question and it is an extremely important one. Is it the idea of this conference that these apply to scales used in the ordinary transactions of trade of buying and selling or are they to

[1] The section referred to reads as follows:
I. Application of tolerances and specifications.—These tolerances and specifications are to be construed to apply to the usual types of weights and measures and weighing and measuring devices used in ordinary commercial transactions or usually coming within the jurisdiction of the weights and measures official, but only when a proper classification is herein provided for them. They shall also be construed to apply to apparatus used for special purposes, whenever and in so far as they are clearly applicable, but not otherwise.

apply to all types of weighing instruments used in all establishments for weighing purposes? If Mr. Fischer will answer me by letter, I will be pleased to write to him. I want an answer to that question.

The CHAIRMAN. By whom?

Mr. REICHMANN. From the bureau, or I would like to have it from the conference. I want to know whether the tolerances and specifications apply only to such weighing and measuring devices as are used in trade; in selling and buying commodities?

The SECRETARY. I think what the committee has tried to do is to cover all the weighing and measuring devices that the sealer would have to deal with. Cream-test scales, and things of that sort, are not used in buying and selling in the sense that some of the others are.

Mr. DOWNING. In our State we have modified that application of the specifications so as to conform to our law. We put in the proviso, "offered for sale," because that is incorporated in our law. Under that we have authority to go into our stores where weighing and measuring appliances are offered for sale and test them, and condemn them if they do not comply with the specifications and tolerances adopted by our superintendent.

The CHAIRMAN. Dr. Reichmann, is it your idea that this paragraph should be modified as not sufficiently clear?

Mr. REICHMANN. It is not sufficiently clear to me to answer the question to a gentleman who would like to know. However, I will submit the matter in writing, and see if I can get an answer from the bureau. I do not like to go into any personal matters, but I do not want to have simply an ordinarily clap-trap interpretation of law from people who are not lawyers. I want an intelligent answer, so I will write for it and withdraw my question at this time.

The SECRETARY. It seems to me the wording of that paragraph is perfectly clear. If Dr. Reichmann wants that modified in any way and he will give us a specific modification we will be glad to entertain it.

The CHAIRMAN. If it is not clear or specific it is entirely proper for us to discuss modifications of it just as much as it is for us to discuss what we have been doing. If there is any reason why it should be changed to make it more consistent with the State laws, or for any other reason, I would be glad to have you make a suggestion. I think this grew out of the act of the conference. You might think that over, and to-morrow make a suggestion for modification if you wish it modified. I will be glad to entertain a motion on that at any time.

RESOLUTION REGARDING THE SALE OF WRAPPED MEATS.

Mr. MARONEY. Mr. Chairman, one of our members here who has a resolution and does not know whether he is going to be here for the rest of the conference would like the privilege of introducing it, and I move you, sir, that we suspend the order of business and give Mr. Eylers an opportunity to introduce his resolution.

The CHAIRMAN. Does Mr. Eylers want to present this without giving it to the resolutions committee?

Mr. MARONEY. Yes, sir.

(The motion was seconded and agreed to.)

Mr. EYLERS. Mr. Chairman, I will read the resolution:

Resolved, That the National Conference on the Weights and Measures of the United States, in conference assembled in Washington, D. C., May 23–26, 1916, records its disapproval of the opinion and regulation established by the Bureau of Chemistry, United States Department of Agriculture, dated June 5, 1914, regarding the permissibility of the offer for sale and the sale of wrapped meats on the basis of gross weight for net weight. This regulation aforesaid permits in interstate-commerce traffic the sale of all character of wrapped meats gross for net, and in so doing, when these commodities arrive in local communities within the border line of States, conflict arises with State, city, and county laws providing for the offer for sale and sale of wrapped meats on a strictly net-weight basis: Be it further

Resolved, That this regulation, established under the three Secretaries of the Departments of Agriculture, Treasury, and Commerce, of the United States Government, respectively, militates to the serious injury of the consumers of wrapped meat products in the United States, as well as affecting trade conditions regarding retail merchants in such wrapped products, and it further operates in interfering with the conduct of the administration of the office and duties of weight and measure officials in the United States, who are confronted with the conditions that commodities come into their territory through interstate commerce, the origin of the evil being with packers of these products at a distance from local communities, thus forcing a condition upon local weights and measures officials to the injury, expense, and nuisance of local communities: And be it further

Resolved, That a copy of these resolutions be sent to each of the Secretaries of the departments aforementioned, as well as to each Member of the House of Representatives and to each Member of the Senate of the United States and to the governor of each State in the Union.

Mr. JOHNSON. I move the adoption of the resolution.

(The motion was seconded and agreed to.)

The SECRETARY. I wished to speak against that resolution as at present worded, but inasmuch as it is passed I presume it is too late.

Mr. JOHNSON. May I explain that resolution? That is for the purpose of creating public opinion throughout the country to overcome the regulation established in the Bureau of Chemistry of the Department of Agriculture. As a second resolution, I am willing that the matter be not referred to the House of Representatives.

The CHAIRMAN. If there is no further business this evening a motion to adjourn is in order.

Mr. JOHNSON. I move that we adjourn.

(The motion was seconded and agreed to.)

(Thereupon, at 5 o'clock p. m., the conference adjourned to meet at 9.30 o'clock a. m., at the Raleigh Hotel, Friday, May 26, 1916.)

SIXTH SESSION (MORNING OF FRIDAY, MAY 26, 1916).

The conference reassembled at 10 o'clock a. m. at the Raleigh Hotel, Dr. Stratton presiding as chairman.

PROPER REGULATIONS FOR THE WEIGHING OF COKE, BY F. G. BARNARD, CITY SEALER OF BATTLE CREEK, MICH.

Mr. Chairman and gentlemen of the convention, I can assure you that my remarks this morning will be rather short and I hope to the point. I wish to have a heart-to-heart talk on a proposition which I am extremely interested in and which I believe you will be more or less interested in if your section of the country uses this commodity commonly called coke.

The question of the moisture contained in coke and the regulation of the sale of that commodity is becoming a very important question, especially in the Middle West, on account of the high cost of anthracite coal, due largely to the exorbitant freight rates that we are compelled to pay out there, and it has required the public to look for fuel that is more reasonable than anthracite coal; consequently they have decided to use coke. On account of that reason we have been compelled to do something to protect the people from buying a lot of moisture in coke. In the first place I will give you briefly a few of my reasons for going into this proposition.

I commenced to get complaint after complaint on account of the great amount of moisture in coke, and, in fact, there was so much moisture that after the coke had been deposited in the bins streams of water, in some instances, would be running out of the bins. As I have said before, complaint after complaint came into the office, and I was unable under our law to do anything. Consequently I commenced to cast about for some data with a view of drafting a regulation for that commodity. I found the data was very meager, other than what the chemists had determined to be the chemical analysis. I commenced my experiments in the first place having in view the sale of coke by cubical content, but I soon discovered, however, that that was not practical. We could enforce that so far as our city was concerned, but when we commenced to deal with corporations from other States which were manufacturing coke it would be impossible to enforce a proposition of that kind. Consequently we then endeavored to determine what the commercial dry weight of coke might be. Our experiments were carried on with our local gas company and the Solvay Coke Co., one of the largest coke manufacturing companies of Detroit. We carried on a series of experiments for practically six months before we got down to an

equitable basis. We got these commercial dry weights in this way: Our experiments were tried by the cubic foot and then by the cubic yard. We dried the coke out and then submitted the coke to favorable domestic conditions; that is to say, we took coke which was bone dry and set it outdoors on a sunshiny day, and we found on the average of all the different sizes and grades of coke that there would be an increase in weight of about 5 per cent on account of the absorption of moisture. We added to the bone-dry weight this 5 per cent and established what we determined to call our commercial dry weight of coke. The weights of the various grades of coke per cubic foot are as follows: Gas coke, furnace or egg size, 25 pounds per cubic foot; the stove size, 27 pounds per cubic foot; the mixed size, 26 pounds per cubic foot; and the nut size, 28½ pounds per cubic foot. The product coke, which is a denser coke, furnace or egg size, 27 pounds per cubic foot; the stove size, 29 pounds per cubic foot; and the nut size, 30½ pounds per cubic foot. In order to take care of contingencies bound to arise in the transportation of coke from one point to another, we allowed a tolerance on furnace and egg size of all grades, 8 per cent; on all other sizes beneath that, 10 per cent. That was, as I said before, to take care of any contingencies that might arise. That we embodied into an ordinance, which is very short and which I will read to you.

An ordinance regulating the manner and method by which all kinds of coke shall be sold. exposed for sale, offered for sale, kept for sale, or attempted to be sold within the corporate limits of the city of Battle Creek:

"Be it ordained by the commission of the city of Battle Creek as follows:

"SECTION 1. That from and after the passage of this ordinance it shall be unlawful for any person or persons, firm, or corporation to sell, expose for sale, keep for sale, offer for sale, or attempt to sell within the corporate limits of the city of Battle Creek any kind of fuel known as coke, either Solvay, Otto, gas, or any other kind of coke, without fully complying with the terms of this ordinance, and any violation thereof shall be punished as hereinafter specified.

"SEC. 2. All persons, firms, or corporations who, by themselves, their agents, employees. or servants, are engaged in handling any kind of coke, shall not sell, keep for sale, offer for sale, or attempt to sell, or expose for sale any coke of any kind that shall be wet or dampened by any process whatsoever prior to the weighing and delivery of the same to the retail purchaser. It shall be unlawful for any person, firm, or corporation, by themselves, agents, employees, or servants, to sell, offer for sale, attempt to sell, expose for sale, or keep for sale any coke the maximum amount of moisture in which exceeds in furnace coke 8 per cent and in stove, nut, and all other sizes 10 per cent.

"SEC. 3. It shall be the duty of the sealer of weights and measures to inspect and test, or cause to be thoroughly inspected and tested, all coke as above designated within the city of Battle Creek, to determine the amount of moisture therein contained as may be necessary to enforce the provisions of this ordinance.

"SEC. 4. Any person, firm, or corporation who, by themselves or itself, his or its employees, servants, or agents, shall violate any of the provisions of this ordinance, shall be punished by a fine of not less than $10 and not to exceed $100 and costs of prosecution, or by imprisonment in the county jail for not less than 10 days nor more than 60 days, or both such fine and imprisonment, in the discretion of the court.

"SEC. 5. This ordinance shall take immediate effect upon publication in the Battle Creek Moon."

A little later on I will explain to you an amendment that I am going to put into this ordinance that I think would be a good thing. The matter of checking up the coke is another important proposition. I compel all dealers to provide themselves with a cubic-foot measure,

and each day, or twice a day or three times a day—as many times as may be necessary—they must test the coke they are selling, in order to determine the amount of moisture the coke contains. If that coke contains over the tolerance allowed by this ordinance, they are compelled by regulation, in order to sell that coke, to compensate for the excess amount of moisture in overweight and to so designate the same on their bill. Then I take a sample from the earliest wagon going through the street and in a few minutes I can determine what the moisture percentage is in this way. I have our commercial dry weight and I know the weight of our cubic-foot measure, and I take a sample from the wagon or car to the scale and weigh it; that is, I take a cubic foot, well shaken down, so that there is no opportunity for holes, then strike it off and get the weight; then I subtract from the weight just found the commercial dry weight, and we will have the number of pounds of excess moisture in that particular cubic foot of coke. Then it is a very easy matter to compute that into per cent and determine what amount of excess weight they have to allow in order to comply with this ordinance. I have had very little trouble in enforcing the ordinance, as the dealers test the coke several times a day, as required, and only on very few occasions have I been compelled to make the wagon go back to the yard and refill.

We also test various cars of coke that come into the city. Whenever a car of coke comes into the city the dealer tests it by cubic measure, and if he finds it shows an excess amount of moisture he immediately notifies the department and the inspector tests the car, taking a composite sample from various sections of the car in order to determine what the average moisture is. That record is brought to the office and a certificate is issued showing what percentage of excess moisture the coke in the car contains, and the producer who sold the car of coke to the local dealer is compelled to deduct from his invoice price that per cent of moisture when our local dealer remits to him for his particular car or cars of coke.

Just to show you what has been saved in our city, a city of 40,000 population, I will give you a tabulation of the records we have kept. We require the various companies to keep a record each day of the moisture that they allow—that is, the excess moisture on every wagon, ton, or car shipped into the city—and send that record to the office. Then as we make the test that record is compiled. Our local gas company sold last year 14,000 tons of coke. The average excess percentage of moisture—that is, over and above the tolerance which we allow—was 3 per cent, or 420 tons. Four hundred and twenty tons of coke were compensated to the users of that fuel on account of the excess moisture contained in the coke. At the retail price of $6.25 per ton it meant a matter of $2,625 saved to the consumers of coke in the city of Battle Creek. There were 7,000 tons of product coke shipped into the city and sold, and the average excess per cent of moisture found in that coke was 4 per cent, or 280 tons of coke delivered for excess moisture, at $7 a ton, which amounts to $1,960. Adding the two together, it would make a matter of $4,585 saved on coke alone to the city of Battle Creek during the past fiscal year.

That is all I have to say relative to the matter, and if there are any questions any of you desire to ask I will do my best to answer.

DISCUSSION.

Mr. Downing. I would like to ask if in determining upon your method you have made any comparison with the chemical analysis by which the moisture contained in the coke is obtained. If so, how did they compare?

Mr. Barnard. Some; but we discovered right away that chemical analysis would not be practical in the field and we had to adopt a method that any dealer could use; consequently this was the method we adopted. There was a slight variance between the amount found by the chemist and what we found, because the chemist in getting the bone-dry weight would mash the coke all up and in that way got out more moisture than we did.

Mr. Downing. How do you get an average sample from a car?

Mr. Barnard. We take a cubic-foot measure and fill it from the different parts of the car; that is, we start at one end and every few feet we take a sample and then we dig down beneath the surface and take another sample, and so on through the car, until we get what we call a fair average from that particular car.

Mr. Briggs. Do you always use a cubic-foot measure of the same shape?

Mr. Barnard. Yes, sir.

Mr. Briggs. How many samples do you take and what variation do you get on the sampling of the same car?

Mr. Barnard. You mean what the difference might be in one sample from another?

Mr. Briggs. Yes. The point is, the weight given by you runs from about 26 pounds to 30 pounds per cubic foot. The tolerance runs from 8 to 10 per cent. So that, roughly, the tolerance allowed corresponds to about 2½ pounds on a cubic-foot basis, and my conception of coke is that it is in rather large pieces, and it seems to me in selecting your sample you might easily get a variation of 2½ pounds. I was interested in finding out how well you could repeat.

Mr. Barnard. You mean if I took two or three samples from the same place in a car where it ought to weigh practically the same?

Mr. Briggs. Yes; by repeating your work.

Mr. Barnard. I will get within a pound each time. I have tried that a great many times in making the experiment. That was the reason we allowed this tolerance, because this is a practical method and not a technical method. It is a method that could be adopted by any dealer. In order to take care of the contingencies that might arise we allowed this tolerance, and I might say the various coke manufacturers we have been dealing with are perfectly satisfied with the proposition and call it fair and have adopted it in other States.

Mr. Briggs. What shape is this cubic measure?

Mr. Barnard. One foot square and 1 foot deep. I require every dealer to have a cubic-foot measure similar to mine, and it has to be brought to the office and inspected before I allow it to be used. I require every dealer to have the same size measure of the same dimensions as mine, so that the tests will correspond.

Mr. Sweeney (of Boston). I would like to ask the gentleman if, in his experience as a weights and measure official, the question has

ever arisen in a court case as to the correctness of the method he has adopted? That is, if some concern with whom he has had some difficulty on this question has seen fit to test the legality of the method which he has adopted as compared with a strict technical analysis by a chemist?

Mr. BARNARD. In answering that question I will have to say it has never gone to the courts, because a coal dealer in Battle Creek would have very small chance if he attempted to fight a case of that kind in our city. But, nevertheless, I went into that matter with our city attorney and he took it up with the higher authorities as to what would be the probability of losing out in the supreme court if it went there, and the city attorney told me that as long as we could verify our standard that it would be the standard of the city of Battle Creek, and if anyone wished to do business in the city of Battle Creek they would have to comply with the standards adopted by that city, and as long as we could prove our standards it would undoubtedly be upheld in the supreme court. But we have never had a case go to the courts.

Mr. FERNER. By 8 and 10 per cent tolerance you mean 8 and 10 per cent over commercial weight?

Mr. BARNARD. Yes, sir. We do that because 5 per cent we could not control. Then we have allowed 8 and 10 per cent to take care of contingencies, such as Mr. Briggs spoke of, because it is not as technical a test as it might be.

Mr. HANSON. I would like to ask Mr. Barnard if he does not think it more practical to sell coke by measure rather than by weight?

Mr. BARNARD. I do not; no, sir.

Mr. HANSON. Our law in Massachusetts is that coke in quantities of 100 pounds or more may be sold only by weight. In Massachusetts coke is stored outside in open air and it absorbs a lot of moisture. We have not gone into this as thoroughly as you have, but it was my opinion that I should recommend to the legislature the enactment of a law which would allow the sale of coke by measure instead of compelling the sale by weight. I am still of the opinion that selling it by measure would be the practical way and easier for the sealers throughout the State to check it up. What you want is the consumer to get what he pays for. I think you would get the same result in selling by measure.

Mr. BARNARD. In answering that question, in my opinion, that is a step backward.

Mr. FARRELL. Do I understand you want coke sold by measure?

Mr. HANSON. Yes.

Mr. FARRELL. I thought you were against dry measure in Massachusetts.

Mr. HANSON. We are on certain commodities.

Mr. FARRELL. Do you think coke should not be included in that?

Mr. HANSON. From our experiments I believe that coke should be sold by measure.

Mr. BARNARD. Continuing, Mr. Chairman, I believe that would be a step backward, and in the second place you would have to establish so many standards you would have a headache trying to keep up with them. I gave that up as not being practical.

Mr. HOWE. Is the coke kept under cover in the yards?

Mr. BARNARD. We do not state in the ordinance that it should be kept under cover. We say the moisture must not be above this tolerance.

Mr. SWEENEY (of Boston). I would like to ask the gentleman if he has ever taken the analysis under his method of, say, approximately a ton of coke, and then have that ton watered down to a certain degree, and if he has then made a subsequent test; if so, what were the results of the tests?

Mr. BARNARD. I have taken several tons, and I have taken a car of coke and done the same thing. In coming to my figures, I worked with Mr. Bluefield, who is superintendent of one of the coke companies of Detroit, and with the superintendent of the gas company of my city, and both of these concerns were very nice to me and furnished anything I wanted in the way of wagons and teams or even cars of coke to experiment with. I found in some instances that gas coke would take on as high as 40 per cent of its own weight in moisture. Solvay coke would take on about 25 or 30 per cent.

Mr. DOWNING. I am very much interested in this subject of moisture in coke in my State, and I have made a comparison of the method used by Mr. Barnard and the chemical method. I took Solvay coke, egg size, and made six determinations. Before shaking down, the weights were 28 pounds, 27 pounds 2 ounces, 29 pounds 6 ounces, 29 pounds 4 ounces, and 29 pounds, and the average was 28 pounds 9 ounces. Then I shook that coke down and I found that there was a variation of nearly 3 pounds. It ran from 27 pounds to 30 pounds. Then I dumped out the coke and put it back in a cubic-foot box, and I got a variance from the same coke of over a pound, which would mean approximately 3 per cent. This was coke that contained less than 9 per cent of moisture. I understand Mr. Barnard's ordinance allows 13 per cent. I took coke that had been exposed to the elements, following very heavy rains, and that coke contained less than 9 per cent of moisture. Of course it was Solvay coke and not gas coke, but it does seem to me that if one were to carry this thing into court and use the method Mr. Barnard uses in his city, that one would not have a ghost of a show of convicting the dealer. I do not think the method is practical or would stand the test of the court.

Mr. BARNARD. In reply to that, it has stood in our city for two years, and they have not attempted to take a case to court. I wish they would. I agree with Mr. Downing that it is not a scientific, technical way of handling the situation, but we can not do that as sealers of weights and measures, for we have not a chemist and we can not run to him to have a test made. Suppose we did have? It would take some time for a chemist to determine what per cent of moisture was in that particular coke. We want a proposition we can determine right away on a practical basis as to how much moisture there is in the coke. We believe in Battle Creek that this ordinance has solved that problem, and at least we have succeeded in saving the city $4,585 in the last year, and I think that is argument enough in itself.

Mr. FERNER. I would like to ask the speaker if the retail price of coke has increased since the passage of this ordinance?

Mr. BARNARD. It has not.

REMARKS MADE BY SEVERAL CITY AND COUNTY SEALERS.

The CHAIRMAN. That closes the regular order of papers. I must confess I have been greatly pleased at the number of technical subjects taken up and the great interest shown in them, and in that respect this meeting has been an immense improvement over all of our previous meetings. The last paper is a good illustration. It shows the various officials are getting interested in the real questions of their work.

At the beginning of the meeting many expressed a desire to hear from some of the principal city officials who are present. I think it would be a mistake to go away without hearing from some of the city officials, and I will ask one or two from each State, especially where there are large cities, to speak, and we will start with Mr. Cluett, of Chicago. We would like a brief report from Mr. Cluett.

CHICAGO, ILL.

By W. F. CLUETT, *Chief Deputy Inspector of Weights and Measures.*

Mr. Chairman, I am pleased with the opportunity of being at the convention and meeting the members, but I did not come down with the understanding that I was to be called upon to make any remarks. Speech making is not my forte. I am a good listener.

We are continuing to enforce ordinances in Chicago to the best of our ability the same as we have in the past. We have not had any new ordinances passed since the last conference. There are several new situations that have come up, one in regard to the toilet-paper matter which was taken up yesterday. That was presented to the Chicago department, and we are now looking into that. At the present time I feel the selling of rolls of paper by count of the sheets would be a very good thing, and believe that each of the rolls should be so marked.

We have considered the question of wrapped hams and sides of bacon, and feel that they should be sold on a net basis instead of gross weight.

I do not wish to take up the time of the convention, but if allowed I will submit a report as to what we have done in the past year.

The CHAIRMAN. We will be glad to have you do so. We would now like to hear from Mr. Farr, of California.

KERN COUNTY, CAL.

By L. H. B. FARR, *Sealer of Weights and Measures.*

Mr. Chairman, California is a State of its own, and I was fortunate in getting to come to this convention as the only representative outside of Mr. Johnson, the State representative. I traveled a long time to get here, and I consider it very much of an honor to talk to you this morning.

I am only a local sealer, but in our State the local sealers think quite a good deal of themselves; they do not only have a good impression of themselves, but also of the State department in general. Our superintendent works with us hand in glove, and anything we

do we are backed up in by the superintendent. We have a local association formed by the different sealers, and Mr. Johnson is president ex officio. We go to the meetings and discuss questions. Last year we formed our association, and from now on we think we will have a very efficient body.

I will give you an idea of how the county sealer's work is laid out. If we go into a store, and there is a scale in there that we think should be condemned after a test, we simply condemn it. If it is a new scale which does not meet with our approval, we condemn it, but give the dealer a receipt for it and notify him to turn it in to the wholesaler who sold it to him. Then we take it up with the wholesaler and notify him that the scale does not meet with our approval. Of course this also applies to any measure or weight that comes under our supervision. We tell them that such apparatus does not meet with our approval, and they send it back to the manufacturer and the manufacturer makes it good. We take this stand: On first or second offenses we have been lenient and do not prosecute. The prosecutions in California, especially in my district, are very few, and, in fact, I have not had any, though I have thrown scares into three or four people by bringing suit and afterwards dismissing suit, bringing to mind that we do mean business. When we go back the wholesaler has the opportunity of making good or standing a prosecution, and to avoid the notoriety of prosecution he makes good.

It is the same way with milk bottles. As Mr. Johnson told you on yesterday, milk bottles come from the East; and if they do not meet with our approval we condemn them and write to the eastern manufacturers, but their bottles are never returned. Once we get our hands on them, those bottles belong to us. But the eastern manufacturer must make his bottles good, and he does in every case, because you can realize that a man's name, which he builds up in business, is the greatest asset he has; and if you take it away from him by prosecution of any kind, you have taken away from him that which it has taken him a lifetime to gain.

As to the way I get publicity in my particular county, I have a big special truck, with a body on it like a patrol wagon. In the center there is a partition and at the end of each one of these different boxes, holding eight 50-pound weights, there is a ratchet to fix the weights securely. That truck carries nearly a ton of weights. Then in the center I put the rest of my testing devices, and that truck goes all over the county. The way I carry on publicity is this: When I was first appointed, the grocerymen called me into conference with them, and they cordially invited me to address them. So I appeared on the scene about half past 8 in the evening without having eaten any dinner and in readiness for a huge banquet. But I found they had finished after being invited to a dinner. So I addressed them and explained the weights and measures proposition. Then the druggists took it up, and they were a little more lenient, and I did get a glass of wine. Then the ladies' club invited me to address them, and there are lots of ladies in that town and lots of young girls, so I prepared quite an elaborate display of the different milk bottles, etc., and made it elaborate and explained to them when I started that it was a bachelor's dispute. I talked for a little over two hours to those people explaining weights and measures. From then on it was an endless chain, and wherever I go the different ladies' clubs have requested me to address them.

Occasionally we put an article in the newspaper letting them know that I am alive. That is the publicity campaign we carry on, or at least I do. I am speaking of "I" because I am the one who got the trip. My county is particularly blessed with wealth, although the representative is not. My county has a million and a half in reserve in bank and our bonds sell at a big premium.

One-fourth of the world's production of oil is produced in that county from the fields of Bakersfield. My board is very lenient with me; they realize the efficiency of the sealer and the importance of his work, etc., and all that I do is to tell them what I want and they give it to me. In fact, I expect my county is one of the most oddly situated counties in this respect, that there is in the country. A local sealer, being a county official, may issue the budget each year to cover the cost of apparatus and cost of my expenses, and also the cost which I have to assume at times. That is the way I carry on the work and, as I said before, the first thing I did I made the merchant know that I was his friend. I do not go through and try to make myself known by prosecutions and prosecuting indiscriminately here and there, for I do not believe that is the right method.

If anything comes into my county, milk bottles or measures of any description or kind, before anything is unpacked, before a scale is put in use, the dealer notifies me and I go and inspect it, or give him the privilege of putting it on his counter for sale without inspection. However, I will say that I work without deputies, as I do not consider them a desirable asset, because sometimes they are like the man in the Ohio Penitentiary, they tunnel under you.

Everybody cooperates with me; the merchants and the people know that I am their friend. The idea of the local sealer, I believe, should be to cooperate with his people and make them know that he is their friend; he should work with them and not discriminate against the producer in favor of the consumer, because I think the producer has as much right to legislation and protection as the consumer.

I will give you one little instance in particular. I went to a diary to inspect bottles and the proprietors knew what was coming and they knew they were going to lose something. I tested the bottles, and in testing them I began to set away the bad and the good, and they were very uncivil to me. I kept going on and paying no attention because those things do not affect me very much, and when I finished the delivery man came with the milk. He had ten 10-gallon cans of milk to deliver to this particular dairy. They did not have their own cows. When the delivery man came with the milk I tested his 10 cans and all 10 of them went on the wagon together with the bottles that I had taken from the dairy, and I showed those people that they had been losing over 2½ gallons of milk out of the hundred gallons. Then they set up the cold milk to me. I am their friend, and I showed them that. I believe that is the method of the State and county officials.

If there are any questions I can answer officially I will be very glad to do so.

The Chairman. I want to say to some of these orators from the East that you have to look to your laurels hereafter. Is Mr. Austin, of Michigan, here?

DETROIT, MICH.

By GEORGE F. AUSTIN, *Sealer of Weights and Measures.*

Mr. Chairman, I only wish to say that I have been greatly interested in these meetings and think that they have been profitable to all. In Detroit there has not been very much progress, for the reason that, although the city has grown about 50 per cent within the last five years, owing to the great number of manufacturing interests which have been located there in that time, it has been impossible for me to get any increase in the numbers of my force.

However, we think we are keeping fairly abreast with the situation and hope, at least, that we are not losing ground. I do not wish to take up any more time of this convention, but desire to express my satisfaction at being here.

The CHAIRMAN. There are others we ought to hear from, but some have expressed a desire to take up one or two matters of business, and if we get rid of them we can go on with hearing from the local sealers.

REPORT OF THE COMMITTEE ON CONSTITUTION AND BY-LAWS, PRESENTED BY W. F. CLUETT.

Mr. Chairman and gentlemen, as a member of your committee on constitution and by-laws, I herewith beg to submit to the officers and delegates of the Eleventh Annual Conference on Weights and Measures of the United States a majority report, wherein all members of your committee concur with the exception of one.

We desire to recommend the adoption by this conference of all of the provisions of the constitution and by-laws as proposed at the tenth annual conference and as reported in the official report of said conference, with the exception of article 3, section 3, in reference to which we recommend as follows:

Strike out all of section 3 of article 3 and insert in lieu thereof the following:

"Senior members shall be the chief executive (by whatever title designated) of Federal or State departments of weights and measures or their representatives, and the chief executives of departments of weights and measures of insular possessions of the United States or their representatives.

"They shall have all the privileges of members and shall have the sole vote on questions of tolerances, specifications, and matters of future Federal or State legislation: *Provided, however*, That in States where there is no active State department of weights and measures and there is one or more active city or county departments of weights and measures within that State, or in States where there is an active State department having no jurisdiction over such city and county department, then the chief executive of such city or county department or his representative shall have the same rights and privileges as a chief executive of a State department would have.

"If the aforesaid proviso gives to any one State more than one representative, then such city or county departments shall select one of their number, who shall have the full privilege of a senior member."

In the preparation of our report we have carefully and conscientiously deliberated on each provision taking into full consideration the purposes and objects attending the inception of this association as a national conference.

We have carefully reviewed the progress and development that has been made from year to year, and it is with a sincere purpose of intention that we desire to so ordinate as to prepare an equitable

and substantial basis or plan for future guidance as will perpetuate the true purposes of this conference.

We must not measure the future development of possibilities for usefulness and excellent work by what has been done in the past. We must be truly progressive and constructive.

Each State must be a unit in the proceedings of this conference with equal privilege, and those who have State jurisdiction, thereby carrying the responsibility, should here be vested with the powers of full privilege.

By the adoption of this report you do not deprive any representative from the privilege of participation in discussion or voting on general matters as may come before the conference. It will not divert in any manner the useful service of this conference. It will conserve, to those who are as executive heads directly responsible to the people, the privilege to effectively represent them in a manner that redounds to the general efficiency of all State weights and measures officials, which will make his work and their work the useful work to the people which they have a right to demand.

Respectfully submitted.

CHARLES G. JOHNSON.
WILLIAM F. CLUETT.

Mr. FARRELL. May I request that the resolution under which this committee was appointed to handle this report be read?

Mr. CLUETT. I would like to move the adoption of this report.

(The motion was seconded.)

Mr. HARTIGAN. As a member of the committee on constitution and by-laws, I desire to submit a minority report, and, prefacing my remarks in this report, I desire to inform this conference that I have not been in perfect agreement and accord with the chairman of the committee, Mr. John H. Sherman, with whom I have had many discussions during the last two months, and the report as submitted by the majority of this committee is in direct bearing with the discussion and disagreement had by me with Mr. Sherman. I am in absolute opposition to Mr. Sherman and his views and have been for the last two months. I am likewise in opposition with the views as submitted by the majority of this committee.

I do not mean to intimate that there is any bad faith on the part of any of the members of this committee, but apparently this report has been submitted on the spur of the moment. There have been many changes made in the mind of the chairman of that committee. Without inflicting myself upon you much longer I shall read my minority report which is based entirely upon my disagreement with Mr. Sherman, and in principle it disagrees fundamentally with the views expressed in the report of Mr. Cluett.

MINORITY REPORT OF COMMITTEE ON CONSTITUTION AND BY-LAWS, PRESENTED BY JOSEPH HARTIGAN.

As a member of the committee on the constitution appointed by the chairman of the conference on the weights and measures of the United States for the year 1916, I respectfully submit the following report expressive of the minority opinion of the committee on certain phases of a proposed constitution for the National Association of Weights and Measures officials of the United States.

To all tentative provisions of the proposed constitution as described in articles 1, 2, 4, 5, 6, 7, and 8, except certain minor word changes, and to all tentative provisions in the proposed by-laws as described in articles 1, 2, 3, 4, and 5, except certain minor word changes, your constitutional committee minority member approves.

The tentative provision in the proposed constitution known as article 3 is disapproved, and the following tentative provision is respectfully recommended to be substituted therefor:

ARTICLE 3, SECTION 1. The membership of this association shall be classified as "members and honorary members."

SEC. 2. Members shall be persons who are actively engaged in the enforcement of weights and measures legislation in Federal, State, county, or city employ. They shall have full privileges of the floor in all regular meetings of the association, may take part in all discussions, serve on committees, and be entitled to enjoy all the rights and privileges provided for by this constitution.

SEC. 3. Honorary members shall be persons who, by virtue of services rendered in the advancement of weights and measures legislation, or in the improvement of weights and measures work, or in long and faithful service in the practical field of weights and measures work, have earned this mark of respect from the association, or such persons actively engaged in research or other work subsidiary to or necessitated by weights and measures legislation. They shall be elected by two-thirds vote of the association in conference assembled, upon report from the committee on qualifications for membership. They shall have all the privileges of the floor, and may serve on committees. but shall have no vote and shall not hold office.

In submitting this report to the conference, the dissenting member of the committee on the constitution humbly advances the opinion that in his judgment the National Conference on the Weights and Measures of the United States has not progressed sufficiently to attempt any discrimination to the prejudice of any authorized and legal representative official of weights and measures in the United States.

While the history of weights and measures in the United States dates its origin through 127 years of the Republic, nevertheless the National Government through the Houses of Congress has only infrequently and seldom enacted legislation under and toward the situation of the United States Government in the development of Federal control of weights and measures matters.

Recent activity in weights and measures affairs evidence National or Federal interest in country-wide uplift of these subjects.

In the absence of the Federal authorities assuming proper interest in weights and measures matters, local authorities—beginning with the township and ending with the State—have during these 127 years given their attention to laws, rules, regulations, and policies directed to the upbuilding of weights and measures legislation and its enforcement.

In presenting the minority report of the committee disregard has been made of the situation being either academic or politic. It is essentially economic and educational, and the attendance with voting rights on all subjects at the annual meeting of the proposed national association of weights and measures officials, with the enthusiastic interest that is naturally consequent thereof, is especially necessary at this particular time in the economic and educational movement that is now being forwarded by local weight and measure officials throughout the United States.

In the absence of definite and specific national legislation on the subject of weights and measures in its relation to Federal control

over weights, measures, scales, and balances, with tolerances and specifications thereunder as might come with congressional action, the interest of the local weight and measure official is governed by local conditions, which local conditions are protected by local laws. The interest of the township weight and measure official is as important as that of the State commissioner or superintendent. When membership carrying with it all rights and privileges is limited principally to the chief executive of Federal or State departments of weights and measures, or their representatives or chiefs of departments, or representatives from cities having populations of 300,000 or over, the inference may be drawn that weight and measure legislation in the United States is so perfect that only in such large cities and States higher weight and measure intelligence prevails, or that there is comity between city and county officials with the State weight and measure executive, or that the State commissioner or superintendent authoritatively controls under the respective State law weight and measure officials in the cities and counties of that State. This conclusion is unfortunately true of weight and measure conditions in the United States, in so far as it affects many States of the Union. Our system of government traditionally brought down to the present emphasizes local self-government with particularity to weight and measure legislation and officials, because of its long-delayed development as contrasted with the present modern tendency for National or Federal centralized control.

The forward-looking aspect of the present-day weight and measure situation should hold encouragement to communities to have their local weight and measure officials in a national association until such time as perfect State or Federal control prevails—the bars should be let down, not put up, against what may be considered an unimportant official or community engaged in enforcing the law on weights and measures or in advancing the propaganda to educate the people on the subjects and laws of weights and measures.

In submitting my minority report my disagreement with my colleagues on the committee, who have been painstaking and conscientious in the performance of their duties—and this applies especially to the chairman of the committee, Mr. John H. Sherman—my difference of opinion as outlined in the foregoing passages is held closely to the principle involved and in no manner is to be interpreted as personal to any group or individual engaged in weight and measure work.

Within the provisions of the proposed constitution the exemplary position held by the National Bureau of Standards is inferentially preserved, and its influences with a national association are fostered. Under the shadow of the Bureau of Standards of the National Government these conferences annually will be held, and the local weight and measure official who comes to the mecca of the work he is engaged in will afford him new experiences, ideals, and intelligence.

Respectfully submitted, May 26, 1916.

JOSEPH HARTIGAN,
Commissioner, Mayor's Bureau of Weights and Measures, City of New York; Member of Committee on Constitution and By-Laws.

DISCUSSION.

Mr. FARRELL. Do I understand there is a motion before the house?

The CHAIRMAN. Yes.

Mr. FARRELL. I rise to a question of order. I believe the resolution under which the chairman appointed the committee to report on the constitution and by-laws required that a copy of the constitution should be submitted to the members of this convention at least one month prior to the meeting. As no copy of the constitution was submitted to the convention, I suggest that it would be out of order to vote on it at this time, and that it must go over until next year.

The CHAIRMAN. I must confess, as chairman, my sympathies are much with the last speaker. I remember last year how this was put off on the ground that no one had had an opportunity to look it over. It might have been settled, but we felt that it was unwise to put it through in that way. That objection holding last year, it ought to hold this year. I think that ought to be submitted in due form, in proper time, and I think State and city delegates should come here with this one question before them, What shall be the official status of the delegates? It is a question of State representation—how do you want the States to be represented—and I want the States to settle that question. It is not a question for us to settle, but a question for them to settle themselves, and if we put it off last year it would seem advisable that the same thing be done this year.

Mr. SWEENEY (of Pennsylvania). I move that the motion be laid on the table.

(The motion was seconded.)

The CHAIRMAN. Those in favor of the motion to lay on the table say "aye," contrary "no." The motion is carried.

Mr. BARNARD. Would a suggestion, with the intent of creating harmony in this respect, be in order at this time?

The CHAIRMAN. Yes, sir; I think it would, if there is no objection. I think the committee would like to have suggestions, and, inasmuch as the debate was cut off on this at the last meeting, I think it is entirely in order to have a few remarks.

Mr. BARNARD. Mr. Chairman, having in view a desire for harmony, which I believe every delegate has, I wish to respectfully submit the suggestion I am about to make.

It seems to me that it would be a very good plan, as Dr. Stratton has suggested, that this matter be settled largely by the individual States themselves. I suggest this: That possibly it might be a good plan for each and every State to be represented officially at this conference with a delegate—we will say, for illustration, that the State superintendent, or whoever might be appointed by the head of that department, be one; then at the State conference two delegates should be elected to attend this convention as delegates from that State, making three delegates in all; then each and every State would have an equal opportunity before the convention. If any State had a particular specification or tolerance or proposition that they wanted to bring up at this convention, they could instruct their delegates at their State convention how they would like to have them vote on that proposition. I believe, Mr. Chairman, that under a proposition of that kind this convention could get down to a harmonious

basis. I believe that every representative here looks forward to that end, and I respectfully submit that as a suggestion.

Mr. JOHNSON. Mr. Chairman and members of the conference, I am in great measure responsible for the preparation of the paper, as read by Mr. Cluett, and I do not believe that the wording or spirit of that paper was fairly understood or given the mature thought of the thinking minds of this convention. I have labored with your committee and we have carefully considered all of the conditions which may, it develops, tend for the infusion of a lack of harmony, which ultimately results in the nullity of the deliberations of this organization.

I have discussed this proposition with the minority member of the committee, and at that discussion there was no substantial argument put forth counteracting my contention. I believe in view of the action taken by this conference that I have an erroneous conception of the purposes and intention of this organization. I believe that my governor has the wrong impression. To illustrate to you, under the present regulations and under the present course of procedure, we will take Mr. Creswell, who is here from Arizona, we will take myself, from California, we will take Mr. Howell, from Washington, and Mr. Buchtel, from Oregon. You have there four representatives of four of your progressive States of the Union—I say progressive, because it appears that the coast is not thoroughly understood. We are a progressive people and we have a large population, and I feel that in this work, which is in a measure a new work, we are entitled to a respectful hearing on matters wherein we are the chosen representatives of the people of those States. We will take the combined service of these four men, representing the weights and measures departments in those four States; we will travel here at the expense of the people of these four States, dignified in our positions and feeling that we are important units in the deliberations of this conference. Mr. Farrell or Mr. Hartigan of New York—which is approximately only a step from the place where the convention is held—can, on a Wednesday, appoint four men who have had no experience in dealing with weights and measures problems, who can come here on a Thursday, and those four men can undo all of the representation that is vested in the four men by the people of these four States on the western coast.

I will leave it to your own sense of judgment, gentlemen, is that fair and is that equitable? If you will give to me the courtesy of holding this convention in San Francisco I will undo all of the work, if I so desire, that has been done by this institution since its inception. I will reverse your specifications and your tolerances; I will elect a new president of this convention; and I will hold the convention in California for all time to come.

Those problems are to-day vested in the majority rule of this convention, and, owing to its close proximity to the border States, you can bring 10, 15, or 20 of your men, and, I am satisfied, if he were to exhaust his influence, that Mr. Hanson could by reach of telephone call 100 men here with the same privilege we have.

Our work should be fair, our work stands for honesty of purpose, and for the cleanest things in life. We should exemplify those things here by being fair and equitable under the conditions I have stated.

This is an educational institution, and the county weights and measures officials and the city weights and measures officials have the privilege of voicing their sentiments here and voting on all matters excepting specifications and tolerances and laws appertaining to Federal and State jurisdiction.

It may be contended that the weights and measures officials in the counties and cities are being discriminated against. We hold a convention in the State of California, and I believe a similar meeting is held in the State of New York, where all of the weights and measures officials assembled are given the privilege of the convention in a full degree and in a full measure. There they have a voice in the conduct of the affairs of the State. Does Mr. Hartigan accept all of their recommendations and does he extend to them the privilege in that connection as vested in him? They have this privilege there the same as they have in California, and they are just as intellectual in their deliberations as we are, and they propound practical problems of weights and measures regulation; and the presiding officer, being desirous of the efficiency of the deputies, must be amenable to any resolutions there enacted directing him to introduce certain resolutions for consideration here at the conference.

I am sure that the State representatives have the welfare of the counties and the city delegates in their keeping, and they would not be substantial men, fair-minded, if they were to disregard those recommendations. That gives to the counties and to the cities a direct representative here in the deliberations of the annual Federal conference. We must have a unit of conservative power. We are responsible to the people for the efficiency of our State organizations. The people of the State of California do not find the fault with the county sealers, they will find it with the executive heads; and as long as I must bear the responsibility of efficiency for my deputies I am certainly entitled to a consideration in the deliberation of matters pertaining to weights and measures.

My men thoroughly realize this situation, and in their community, the organization in the State, they propound these problems along educational lines; and there they make recommendations to the State, which I am always conscious of and which I can adhere to and adopt if the conditions warrant their adoption.

We must get away from the idea that this organization is an expedient one. We have had 10 years of pioneer work here and it is time that we dignified this organization by consummation of the power of this organization into a channel where it will do the most good for the benefit of our respective jurisdictions.

I speak on the subject fairly and openly, and I am sure I have not offended anyone. If I have, I want to retract. I come here virtually a new member of the conference, but I have had a great deal of experience in the commercial world—to the extent of 20 years. I know the sentiment of the commercial man; I know what his problems are and should be, and I believe in a progressive, effective enforcement of weights and measures regulations, standing for the privileges for which it is intended and for which the people expect to have its benefit and usefulness. I thank you very kindly.

Mr. FARRELL. I just want to state to the previous speaker that under the constitution submitted, Mr. Hartigan, who represents

some 6,000,000 people—more people than the four gentlemen to whom Mr. Johnson just referred—does not have a vote in this conference under that constitution. I, as the State man, of course would have one vote; but Mr. Hartigan, who represents, as I said, a greater population than the four men spoken of by the previous speaker, does not have a vote in the conference.

Mr. MIKESELL. Mr. Chairman, I do not know exactly what immediate supervision Mr. Johnson has over the sealers in the State of California, but my impression of the work in this Nation is that there are many, many more city departments and immediate districts than there are State departments. That is my impression. My impression at this minute is that the number of States represented is small as compared with the cities and the districts. Am I right?

The SECRETARY. Most city and county representatives, I might say, come from the States that are represented by State officials.

Mr. FARRELL. I understand there are only seven men who are entitled to vote under the ruling of the chairman last year.

The SECRETARY. There are 22 States represented.

Mr. FARRELL. Designated by the governor, and not chief executive, under the constitution.

The CHAIRMAN. That is all right. We have always taken those who have been delegated by the governor.

Mr. MIKESELL. I would state, for the enlightenment of the Western representatives, that the Commonwealth of Pennsylvania has a population of from seven to eight million, and your constitution would require Pennsylvania to have one vote in this conference as compared with the gentlemen enumerated from the coast. The gentleman from Battle Creek submitted a plan whereby each State was to have a State and two other representatives. If that process was to hold true to every State in the Union, why three votes instead of one? Would not one vote each be just the same as three each in a conference?

Mr. BARNARD. Mr. Chairman, I would like to speak in defense of my suggestion for just a moment. With due respect to my friend, Mr. Johnson, from California, I wish to take issue with him on one or two points relative to what he said with regard to Mr. Hanson, of the Commonwealth of Massachusetts, and to Mr. Hartigan, of the great State of New York. He intimated that there might be a disposition to put something over in this convention. I do not believe that there is a delegate elected to this convention who would have any desire to put anything over. I have a very high respect for Mr. Hanson; I have known him personally for some two or three years, and I do not believe that he has any such ideas as that whatever. So far as my acquaintance with him is concerned, it has been fair and open-handed, and I can say the same thing relative to Mr. Hartigan, whom I have also known for two or three years.

Now, if you please, my suggestion to appoint two delegates to this conference from the State conference in addition to the State superintendent, was very brief. Your State superintendents are the political heads of the States, and as a rule I think my colleagues will bear me out that they are removed every three or four years, and your city and county sealers are removed only for cause. The State superintendent comes in and gets a slight knowledge of the work, and

then he goes out. He, under your plan, would be the sole representative of the State; he might have ideas peculiar to himself, and not knowing the practical working conditions of the problems might vote to suit himself. County or city sealers from your conference coming as representatives would know the practical problems and, as a rule, they would be returned year after year to this conference and would be in better condition to vote on these problems than the State superintendent. That is my contention, Mr. Chairman.

Mr. WALDRON. I would like to know in what condition the majority report is now.

The CHAIRMAN. It has been laid on the table. This is a discussion for the benefit of the committee. It did not seem wise to cut off all discussion of the subject.

Mr. WALDRON. This is only for information.

The CHAIRMAN. It is merely an expression of opinion for the benefit of the committee on constitution.

Mr. WALDRON. The report now is practically dead. Does this report have to remain over until next year?

The CHAIRMAN. Yes.

Mr. WALDRON. Is this committee dead?

The CHAIRMAN. No, sir.

Mr. WALDRON. Is this committee supposed to send a report to each one here now?

The CHAIRMAN. Yes, sir; they should have done it this year. That was the technical point upon which the ruling was made. It was postponed last year on that condition, that they would send this draft of the constitution to the delegates 30 days before the meeting, but that was not done and it has gone out on that technical point. Otherwise, there is no reason why it should not be considered and settled to-day. But everyone here wants this to have a careful consideration, and I can assure you next year even that point will not be entertained.

Mr. SWEENEY (of Pennsylvania). I move that the matter be taken up in the different State conferences which will meet shortly and let the States decide for themselves. It can not be settled here.

Mr. REICHMANN. I move, sir, that when this proposed constitution is sent out that at the same time a copy of the majority report and a copy of the minority report be sent with it. That will give them the basis on which the whole discussion revolved.

The CHAIRMAN. Would you add to that the discussion that has taken place here?

Mr. REICHMANN. No, sir; just the majority and minority reports.

(The motion was seconded.)

Mr. REICHMANN. I want to emphasize an ethical question, which is this: That it would be a very unwise action to pass a constitution of that kind. I think this conference is more in the nature of an ordinary business men's association, where they come to interchange ideas and to discuss questions of general policy. If you have a constitution of that kind, naturally it is a body, with the constitution of a closed corporation—only certain members and delegates have any powers—and it is a very nice question as to whether it would not be improper for the Bureau of Standards, as a Government office, to print and send out all the literature in relation to this. In other words, the association itself becomes practically liable for a number

of those debts. We would be morally liable for them anyway, whereas under our present condition we can make efficient use of the services of the Bureau of Standards.

I would like to raise a second practical point, which is this: That in any kind of an organization, to get any kind of efficiency, you have to have some head who has the power, you might say, to dictate lines of policy—you must do so and so and fall in line. The State superintendent or the State officer of a State where organized, if he is any kind of an executive, will entrust the local weights and measures official with his authority. In a similar way these tolerances are suggestions to these people to guide themselves by in exercising authority for the very reason that the gentleman from Battle Creek mentioned, namely, that many of the State executives change from time to time, whereas the local representatives are more or less under civil service and these tolerances are to guide them. So far as the privilege of voting on tolerances is concerned, I do not think it amounts to so very much, for the reason that the committee on tolerances very properly assumes the right to dictate to the conference as it is.

Mr. LYTTON. Mr. Chairman, it seems to me if copies of the majority and minority reports go out, together with any constitution, that it would be in order to add to that the argument that we have had this morning, in order that everyone may be informed as to what has to be considered. I therefore move to amend the motion of Dr. Reichmann to include those arguments.

Mr. REICHMANN. I accept that.

Mr. HARTIGAN. It has impressed me very deeply, that in an aggregation of this character, composed of men who are working along ethical and moral lines, that we should reach a more perfect conclusion if we disregard entirely a constitution for this conference or for future national conferences of weights and measures men because of the progress which has been made in the past. We are already without a concrete, definite constitution, or regulations and rules to follow. Until that time has arrived in this country when the National Government has perfect control it would be a high order of morality on the part of this conference if they disregarded entirely even consideration of a constitution.

I make these remarks merely for the purpose of the record, so that when the men go back home they may be able to study well the question, because what they are engaged in, so far as weights and measures work is concerned, is a work for the people. We are not to feel more dignified, we are not to have our self-respect increased merely because we come to a conference. We are paid servants.

During the past 10 or 11 years you have made wonderful progress. The statement has been made that you have in this conference 22 State representatives delegated by their governors. There certainly has been an increase over what you had here 10 years ago and you have not had any constitutional question to bother or disturb the deliberations of this conference, except that of last year, and if this question continues it is bound to be a thorn in the side of future progress and it is bound to introduce the personal issue, all of which is disgusting to the mind and retards the progress of the ethical side of the question in which we are engaged.

The CHAIRMAN. Are you ready for the question? Those in favor, say "aye"; contrary, "no." The motion is carried.

The next report is that of the committee on the metric system. Is the chairman of that committe present?

Mr. HARTIGAN. I am making a few corrections in my report and it should be here in 15 or 20 minutes.

REPORT OF THE COMMITTEE ON NOMINATIONS, PRESENTED BY J. F. FARRELL.

Your committee on nominations makes the following report:

For president, S. W. Stratton; vice president, William L. Waldron; secretary, Louis A. Fischer; treasurer, Burr B. Lincoln. For the executive committee: S. W. Stratton, Louis A. Fischer, John F. Farrell, George E. Carpenter, Charles G. Johnson, Leo S. Schoenthal, Thomas F. Egan, John M. Mote, Fred H. Tighe, W. F. Cluett, Edward C. Lytton, James Sweeney (of Pennsylvania), James R. Smith, and F. G. Barnard.

Mr. REICHMANN. I move that the report be accepted and that the officers be elected by acclamation.

(The motion was seconded.)

The CHAIRMAN. It is moved and seconded that the report be adopted by acclamation.

Mr. JOHNSON. May I have the pleasure of adding one or two names to the executive committee?

The CHAIRMAN. Unless it is fixed by resolution.

The SECRETARY. It is fixed by resolution adopted a year or two ago, Mr. Johnson. You would have to introduce a resolution and have it carried.

The CHAIRMAN. It is entirely in order to increase the committee, but I think it stands at 14 now. That is according to the previous resolution.

Mr. REICHMANN. Would a resolution be in order to increase the committee by three?

The CHAIRMAN. There is already a motion before the house.

Mr. REICHMANN. I would like to restate the motion and add that to my previous motion.

(The motion was seconded and agreed to.)

Mr. JOHNSON. I would like to suggest that we add Mr. O. N. Creswell, of Arizona; Mr. I. M. Howell, of Washington; and Mr. Thure Hanson, of Massachusetts.

The CHAIRMAN. Does that meet the consent of the committee on nominations?

Mr. FARRELL. We accept that.

(The motion was agreed to.)

REPORT OF THE COMMITTEE ON RESOLUTIONS, PRESENTED BY CHARLES G. JOHNSON.

Your committee on resolutions have a number of resolutions which we will introduce one by one.

Resolved, That this, the Eleventh Annual Conference on the Weights and Measures of the United States, record its approval for the adoption of the metric system by our interests in the United States to be applied in trade, commerce, and industry. And further be it recommended that local weights

and measures officials cause the attention of merchants, manufacturers, boards of trade, and chambers of commerce to be attracted to the advantages and facilities of the metric system for both domestic and foreign affairs; and be it further

Resolved, That the committee on the metric system be empowered to circulate through the medium of journalism, such as daily, weekly, and monthly newspapers, magazines, and such other periodicals, trade, commerce, scientific, political, and economic information relating to the metric system.

The CHAIRMAN. Inasmuch as there is a special committee on that subject may I ask if that is a resolution of that committee?

Mr. JOHNSON. This is signed by the members of that committee.

Mr. REICHMANN. I move that the resolution be adopted.

(The motion was seconded.)

Mr. HANSON. I would like to ask if that was signed by the committee on the metric system or supposed committee on the metric system?

The CHAIRMAN. Is Mr. Hartigan present?

Mr. HARTIGAN. Mr. Chairman, that resolution was signed by three individual members of this conference.

The CHAIRMAN. I am not familiar with the personnel of that committee.

Mr. DOWNING. Is this a report of the committee on the metric system?

The CHAIRMAN. That is the question I asked.

Mr. REICHMANN. Mr. Chairman, allow me to clarify this, if I may. The chairman of the committee on the metric system is going to submit a report in which he is having some corrections made, but this is a separate and distinct proposition from this resolution which is signed by individual members of the conference. It happens that one of the individual members of the conference is the chairman of the committee on the metric system, and he acts in a dual capacity in that respect.

The CHAIRMAN. It is perfectly in order, but I wanted the members to understand it.

(The motion was agreed to.)

The CHAIRMAN. The next resolution is as follows:

Resolved, That weights and measures officials throughout the United States consult with educational and school authorities with a view to improving the method of teaching and the learning of subjects in arithmetic, mathematics, domestic science, and social economy concerning weights and measures; and further be it resolved that a committee of three members of this conference be appointed by the chairman of the conference as a committee on public education, who will consider and report a plan or syllabus for a constructive method of teaching and learning under the subjects of weights and measures in the schools, colleges, and universities of the United States, said committee to report to the 1917 conference, in the interim, however, sending a copy of their proposed report to all weights and measures officials in the United States to be used for such purposes as they may consider appropriate.

Mr. FARRELL. I move the adoption of the resolution.

Mr. HARTIGAN. For the information of the conference I might state that in the city of New York during the last three months, at one of the schools in the Bronx, we have introduced a new system of teaching the system of weights and measures. It may be astounding to some of you gentlemen to know that the subject of weights and measures in elementary and in some high schools has been entirely stricken from the curriculum. The responsibility for that rests en-

tirely upon the shoulders of local weights and measures officials in not keeping in touch with the present trend of affairs. I do not like very much at the present moment to go into the details of the subject, but I did have a paper prepared, and if you will allow me the courtesy or the opportunity of making it a part of the record, it may be very interesting reading along instructive lines if you will take the time. You should see to it that your local authorities not alone introduce or reintroduce the teaching of the weights and measures system in your schools, but you should improve upon your present system of teaching. How are you going to expect the housewife, the general consumer, to intelligently buy or sell unless she has been taught at the mother seat of public education something in the way of weights and measures, and taught in the same manner as you are at the present time trying to teach both the merchant and purchasing public through various methods. In this school in the Bronx we have introduced what we consider a practical method. It is by no means perfect, but we are experimenting. Unfortunately at the present time the matter has not been considered by our general department of education, but if this system proves to be satisfactory in this free vocational school, it will be recommended to all the other schools in the city of New York, and we have close on to one million and a half pupils. It will be adopted in private, parochial, and public schools generally throughout the country, so it may be well, so long as we have made the start and taken the leadership, to impress upon the children in the beginning and tell them just what 16 ounces mean and what a pint and a gallon means, and that will be one more step in the progress of weights and measures.

The CHAIRMAN. If there is no objection, Mr. Hartigan will be allowed to place his description of the system and the method in the record, and the motion before us is on the resolution. All those in favor say "aye," contrary "no." The motion is carried.

Mr. JOHNSON. The next resolution is:

Resolved, That within 10 days from date a copy of the resolution which unanimously passed the conference on Thursday, May 25, pertaining to "wrapped meats," be sent by the secretary to each of the public officials mentioned therein; in the event of this being inconvenient, then it is directed that the mover and seconder of this resolution may send a copy thereof to the said officials mentioned acting officially as the representatives of this conference.

The CHAIRMAN. You have heard the resolution with reference to the one passed the other day.

Mr. HARTIGAN. That was to prevent unavoidable delay in getting the report to this conference. Mr. Eylers and myself suggest that if the secretary is without facilities to get out a copy of the resolution, we are willing to do it at our own expense and time.

The SECRETARY. I might state there is no difficulty about the secretary getting it out. What I was hoping was that Mr. Hartigan wanted to relieve me of the necessity of doing it. If you put it on that ground I would be very glad of it. As a matter of fact, I would dislike very much to send out resolutions of that kind, and I think Dr. Stratton would also.

Mr. FARRELL. This relieves you of the necessity.

(The motion was seconded and agreed to.)

Mr. JOHNSON (reading):

Resolved, That a committee on the metric system, comprised of three members, be appointed by the chairman of the conference within 10 days from date, and that as an appreciation of the service rendered by Joseph Hartigan, the chairman of the present committee, it is suggested that he be named as chairman of the new committee on the metric system.

Mr. REICHMANN. I move its adoption.

(The motion was seconded and agreed to.)

The SECRETARY. Mr. Chairman, in this connection I would like to read a communication received a day or two ago and then to inquire whether this committee will be authorized to represent the association in this particular case. This letter is from Dr. A. E. Kennelly, representing the American Institute of Electrical Engineers. It is directed to L. A. Fischer, secretary National Conference of Weights and Measures, Bureau of Standards, Washington, D. C., and reads as follows:

DEAR SIR: I beg to inquire whether the city and county sealers of weights and measures would be willing to appoint a committee on the metric system in case some of the engineering societies desire cooperation from your association. It seems likely that such cooperation may be sought for in a general discussion of the metric system, and information on this matter in advance will be appreciated.

Yours, very truly,

A. E. KENNELLY.

I would like to know whether it is the desire of the association to have this committee represent us in this particular case.

Mr. REICHMANN. I move you, sir, that this matter be referred to the committee on the metric system.

(The motion was seconded and agreed to.)

Mr. JOHNSON. The next resolution is as follows:

Resolved, That this, the Eleventh Annual Conference on the Weights and Measures of the United States, in conference assembled, on the 26th day of May, 1916, do declare and record our disapproval of a bill now pending in the House of Representatives of the United States known as H. R. 9323, to regulate and control the manufacture, sale, and use of weights and measures, known as the weights and measures act.

Mr. FARRELL. I move the adoption of the resolution.

(The motion was seconded.)

The CHAIRMAN. Are there any remarks?

Mr. JOHNSON. Speaking on the motion, would it not be well to define just what bill this is? There are a great many weights and measures bills.

The SECRETARY. The bill in question is the Ashbrook bill, which has been approved twice before by this association, and I believe by every weights and measures association in the United States at some time or other.

Mr. JOHNSON. This conference went on record last year as approving this bill, and I do not believe it to be good policy for the conference at this time to change its attitude and fluctuate in a matter of this character. We had this matter before us and discussed it at length last year.

The CHAIRMAN. In other words, the resolution reverses the action of last year?

Mr. JOHNSON. Yes, sir.

Mr. DOWNING. I withdraw my second of the motion. I misunderstood it before.

Mr. CLUETT. I move that the resolution be laid upon the table.

(The motion was seconded and agreed to.)

Mr. JOHNSON. The next resolution is as follows:

Be it resolved, That this conference extend to Mr. L. A. Fischer a vote of confidence, thereby signifying its disapproval of the circulation of any pamphlet or statement unjustly reflecting on the integrity and efficiency of weights and measures officials.

Mr. CLUETT. I move the adoption of the resolution.

(The motion was seconded and agreed to.)

Mr. JOHNSON. The next resolution is as follows:

Resolved, That the Eleventh Annual Conference of Weights and Measures do hereby extend a vote of thanks to the chairman of this convention, Dr. S. W. Stratton.

Mr. FARR. I move the adoption of the resolution.

The SECRETARY. All those in favor of the motion signify by rising.

(The motion was seconded and unanimously agreed to by rising vote.)

The CHAIRMAN. Gentlemen, I want to express my appreciation of this resolution and, as I have said before, my great appreciation and satisfaction at the line which this conference has taken. It is more along the lines intended in the first place than any we have ever had, and I think you will all agree with me that we have gotten more good out of it than any other conference we have held. There has been more real discussion of weights and measures affairs than in the previous conferences.

Mr. JOHNSON (reading):

Resolved, That the Eleventh Conference on Weights and Measures do hereby extend a vote of thanks to the Secretary of Commerce, Hon. W. C. Redfield, for his remarks and interest in the conference.

Mr. CLUETT. I move the adoption of the resolution.

(The motion was seconded and agreed to.)

Mr. JOHNSON (reading):

Resolved, That the Eleventh Annual Conference of Weights and Measures officials go on record as favoring the universal adoption of the count standard in marking toilet paper and paper towels; that is, every roll or package shall be plainly marked to show the number of sheets in each roll or package and the size thereof.

Mr. WALDRON. I move the adoption of the resolution.

(The motion was seconded.)

Mr. FARRELL. There is a question of law now being considered in the State of New York in regard to marking toilet paper. I therefore move you that the resolution be laid on the table until the toilet-paper manufacturers decide for themselves how it should be marked.

Mr. REICHMANN. I do not think that is a question for the toilet-paper manufacturers to decide, but the public should decide that.

Mr. WALDRON. Mr. Chairman, if we are going to wait for the manufacturers to decide, we might just as well wait for the scale men to decide on the type of scale to be used.

(The motion was agreed to.)

Mr. JOHNSON (reading):

Resolved, That a vote of thanks be accorded Mr. L. A. Fischer and the staff of the weights and measures division of the National Bureau of Standards for their labors in behalf of the conference.

Mr. CLUETT. I move the adoption of the resolution.

(The motion was seconded and agreed to.)

Mr. JOHNSON (reading):

Resolved, That the Eleventh Annual Conference of Weights and Measures officials do extend a vote of thanks to Mr. Warren M. Mitchell for his diligent services as reporter for the conference.

Mr. FARRELL. I move the adoption of the resolution.

(The motion was seconded and agreed to.)

Mr. REICHMANN. Mr. Chairman, I move that a vote of thanks be extended to Mr. Parry for his work in connection with the conference. I believe Mr. Parry has been so busy that he has not been able to attend the conferences, but the work of sending out the thousands of letters has devolved upon Mr. Parry. I move you, therefore, that a vote of thanks be extended to Mr. Parry.

(The motion was seconded and agreed to.)

Mr. JOHNSON. I move the adoption of a resolution extending a vote of thanks to all of the members of the conference who have acted on committees. I also desire to embody in that resolution a tender of thanks to Mr. W. W. Boyd, of the Bureau of Standards, for his courtesy and efficiency in serving the conference.

(The motion was seconded and agreed to.)

Mr. REICHMANN. I wish to introduce the following resolution:

Resolved, That when the reports of the tolerance committee are sent out that such reports bear in conspicuous places on the title page the wording, "These specifications are not legal—they are merely suggestions."

Mr. FARRELL. I move its adoption.

Mr. JOHNSON. May I amend that by moving that some such statement be put upon the specifications when sent out and the wording be left to the Director of the Bureau of Standards?

Mr. FARRELL. I second that motion.

(The motion was agreed to.)

The SECRETARY. I might state that these specifications do not contain any statement except what is absolutely true. It stated that they are specifications adopted by the conference. I do not see why we should weaken them in any way by saying they are not legal.

The CHAIRMAN. We will leave it as it is. Specifications suggested for adoption by all weights and measures officials.

Mr. REICHMANN. The way it is now printed is deceptive.

Mr. FARRELL. May I introduce a resolution thanking the manufacturers for appearing at the conference and demonstrating their scales and measuring instruments in connection with the conference?

(The motion was seconded and agreed to.)

The CHAIRMAN. Mr. Hartigan, are you ready with your committee's report?

Mr. HARTIGAN. Yes, sir. Mr. Chairman, I want to acknowledge at the outset what might appear to be a discourtesy to my colleagues on this committee. I have been very much pressed during the last year with work, and it was only during the last 10 days that I was able to complete my report, based upon notes acquired through

study and research made in the last three years, and to Mr. Hanson and Mr. Downing and the other members of this committee I offer my personal apology for not having consulted with them. My intention was absolutely all right, and after you have heard the report you will find that there is nothing radical in it, nothing by way of going up to President Wilson and saying that he must immediately have the people of this country adopt the use of the metric system.

REPORT BY JOSEPH HARTIGAN, CHAIRMAN OF THE COMMITTEE ON THE METRIC SYSTEM.

Your committee on the metric system respectfully submits the following report, based upon the observations of the committee during the past two years, giving study and attention to the rapidly changing economic conditions, domestic and foreign, as they pertain to the financial, trade, commercial, and industrial welfare of the people of the United States.

The unexampled opportunity afforded by the great war in Europe for the advancement of the metric system, and its adoption and use in this country by bankers, merchants, and manufacturers engaging in foreign trade, has given such impetus to the metric system in domestic economic circles as to cause a new revival of the advocacy of the metric system as a practical business factor in this country.

The business community of the United States, as never before in its history, is reaching out in the world for trade. The opening of our new foreign-trade era will result in dismal failure or in pronounced success according to whether our financial and commercial adventurers do not or do proceed by competent methods in languages, customs, and weights and measures to do business. The last mentioned of these factors, as it concerns the unit or the individual in foreign lands, is the first in point of importance since the individual, the ultimate consumer, is the one to be catered to with a greater degree of attention than the importer or the banker or the distributor in these lands.

Weights and measures, whether concerning the metric system or other system used outside the United States, is a subject of primary importance in the relation between peoples; its knowledge in everyday affairs as necessary as is the knowledge of the language of the people of that foreign country.

The enterprise of countless American merchants and manufacturers, engaging in foreign trade heretofore never approached by them, satisfied with domestic concerns, should promote the study, adoption, and use of the metric system in their world trade. These fellow citizens, preparing to make new trade conquests, should make as part of their plan of campaign the introduction of the metric system of weights and measures. It is generally known that all countries outside of the United States, except Russia and Great Britain, use this system, and in these countries the use of this system is permissive. The system was legalized by the American Congress in 1866. It is permissive in character. Thus far, however, its operation as an element in domestic trade is practically unknown, its activity promoted only by diffident scholars whose ambition ceases with an exposition of its merits. There are only two nations

in the world with whom we can trade on the basis of our own complicated system of weights and measures, namely, Russia and Great Britain; and even here there is no general uniformity; for in the former country only one unit is similar, namely, the inch; and in the latter country the capacity measures are entirely different, thus making conversions necessary in these units. Are our new trade internationalists aware of that fact? The other countries in their use of the metric system promise us present and future trouble unless our people in dealing with them discard our system and adopt theirs. The United States and England have lost European and Latin-American trade because of this handicap. The world needs a universal language. That, however, will be longer in coming into realization than a universal metric system of weights and measures.

It may be many years delayed in being adopted generally for use in this country. Its adoption here, however, will be hastened by the new era of foreign-trade expansion, through which the American merchant and manufacturer will be obliged to adopt it in order to satisfy foreign-trade conditions. The demands made upon domestic firms for commodities made and to be distributed upon the metric-system basis will familiarize thousands heretofore ignorant of its usefulness with the system and its proverbial simplicity.

These demands, which must be met or prepared for before being made, will do more to educate our people in the uses and advantages of the system than a fortune spent in a literary propaganda. The American manufacturer is shipping and will continue to ship tons of raw material abroad, little realizing the immensity with which an item like the metric system of weights and measures counts with foreign trade. Added to the disadvantages of not making the terms of measurement understood to the foreign trader is the loss of profit in trade by reason of our goods not being in metric units, while various other items bring the total loss to material figures.

For simple convenience the metric system should be used by our people for both domestic and foreign trade. This system is as much superior to our system of weights and measures as the decimal system in money is superior to the English pounds, shillings, and pence.

Considering the fact that there is not one American or Englishman in fifty who can give the values of half of our tables of weights and measures, it would seem an easy matter to make the change, but it is far otherwise. The fact that farms and town lots are laid off in acres, feet, or rods, that we are accustomed to the thought of the distance represented by a mile and the weight represented by a pound, makes it extremely difficult to inaugurate a change. To weights and measures officials, who are imbued with the metric system and advocate its adoption, its use is replete with meritorious advantages over our archaic system of weights and measures, but they consider it hopeless to attempt the accomplishment of a change. Tradition and custom and habit—brothers in misfortune—have dictated to our loss our system of weights and measures. It is difficult to explain how our wide-awake American populace for years has maintained two systems. Could not gold and diamonds be weighed with divisions of the same unit that measures flour? Why buy drugs by apothecaries' weight, rings by troy, and sugar by avoirdupois? Sometimes the architect makes his plan in tenths and hundredths of feet, and the

carpenter follows to do the work with twelfths of feet and sixteenths of inches.

Our foreign-trade expansionists have not stopped to count the cost involved in expensive duplication of machinery for firms engaged in foreign trade. Our system creates confusion and waste every year. In comparison with a long list of resultant evils caused by our system can be set down the benefits to be derived under the metric system.

In the metric system there is but one standard of weight, but one standard of measure for liquid and dry commodities alike, and but one standard of length.

The metric system of weights and measures has so much in it to commend it that this report will be silent as to a summary of the benefits and equally free from reference to the manifold complexities and wastefulness of our present system of weights and measures.

It is hard, as you know, for old dogs to learn new tricks, but it is easy for young dogs to learn new and better tricks than the older ones learned. The time taken in school with the subject of weights and measures would be materially shortened by use of the metric system, leaving children free to master some of the newer things considered necessary.

We all have been used to thinking in terms of the old standards for so long that the idea of changing to a simpler system strikes us in the lazy spots of our mentality, and we try to bolster up the old with all manner of scares about the new.

A striking illustration of the adoption and use of the metric system from a practical commercial standpoint is furnished by a bridge-building company in the Pittsburgh district several years ago which was running short of structural steel. Competition tried to hold them up on prieces, so they ordered from Belgium. The orders for sizes and drilling had to be given in the metric system. The draftsmen thought at first they would have a hard time of it, but in three days they became so used to it they wished all their work might be in that system. The steel was used by the United States Government and it passed inspection.

At this particular time an agitation was started to have the United States Government require all its work to be done and its supplies to be furnished according to the metric system. It was thought by the advocates of the metric system that factories supplying the Government with material would comply in short order. The general opinion at that time was that some machines would have to be scrapped entirely, but most machines would require only changes in gears, and in gear cutting the metric system would be a distinct gain.

The American woman, however, quick to discern the new things affecting the economic situation, would perhaps be the most formidable objector to the adoption and use of the metric system. The particular reason underlying this attitude of mind is due, of course, primarily to the absence in our public educational system of more extensive methods of teaching and studying the various systems of weights and measures. It is surprising to know that in this modern day many of the lower-grade schools in this country have eliminated the tables of weights and measures from their curriculum. This must be attended to in time. The American women, however, do the bulk of the family buying, and these same American women have

shown themselves equal to most, if not all, of the tasks set before them by the changes in modern life; and should the metric system, although not compulsory under the law of the land, in time become by common consent the weights and measures system of this country, they would soon be buying by the liter, the kilogram, and the meter as readily as they do now in the old system, and the family treasurer would pay the bill in decimal currency as he has to do to-day.

Since the metric system was legalized in the year 1866 in the United States the agitation for its adoption and use has come primarily from men of science and students enthusiastically imbued with the simplicity of the system. Its application, however, to all the needs of the practical everyday life is absent.

While only permissive under the laws of this country, and while the United States Government itself has adopted and used the system only in certain of the governmental departments, its use has been made mandatory by law in the Philippines. Yet in the governmental statistical publications anything other than our own weights and measures system is very rarely used. In our tariff schedules specific duties are mostly fixed by our own weights and measures permissive under the Constitution of the United States, under which schedules, articles are to pay duties in terms of gallons, feet, yards, tons, etc.

The border line between foreign and domestic commerce is at the entrance port to the United States, and the crucial test of a system of weights and measures is its use in the tariff schedule. This is particularly true when nearly two-thirds of the world is using the metric system, and yet under the laws of the United States it appears that the American Congress prefers the old system of weights and measures to the metric system, both of which are permissive. It is obvious, therefore, that Congress has chosen our present system either because they are convinced of its greater practicability or else, in pure ignorance, they are not familiar intimately with the simplicity and advantages of the metric system.

Metric-system advocates favor a law requiring its adoption for governmental purposes, and also compelling its use generally, so ordering the law that the permissive or discretional feature be eliminated and the metric system solely substituted.

These advocates in this country in their ideal seek too much at the outset. Perhaps this is a cause for the delay in the adoption and use of the metric system here. While you may induce the Government to adopt and use it, commerce and industry will not use it and you can not force its use, until the people understand and are educated up to its beneficent advantages. But the mere introduction of a law compelling the adoption and use of the metric system will do some good. Its introduction alone attracts attention—especially the attention of the opponents of the system—and their opinions, loudly and forcefully expressed, are accepted by the people as the utterances of wise men, because the people are unacquainted with its meaning and construe the metric system as some horrible ogre that threatens disturbance, distress, and destruction. It is unfortunately true that metric-system advocates are regarded as typical reformers, and reformers in this country are looked upon askance. In these modern days let us not be known as reformers, promoters,

or propagandists. Let us be projectors in the sense of advancing a project of mutual interest and advantage to all the people.

The metric advocate in his conflict with the uninformed is unwise when he ruthlessly combats their settled habits, their established usages, their domestic and individual economy, their ignorance, their prejudice, and their wants; all of which is unavoidably done in the attempt radically to change or to originate a totally new system of weights and measures without first laying an adequate foundation for its reception.

In any plan which may be contemplated for the adoption and use of the metric system in the United States generally, it would be unwise to attempt to force this system through any legislative body unless a genuine public demand was first created. The adoption by law and the use of the metric system by the people should come naturally and without trouble, inconvenience, or coercive measures. The people of the various strata of society must first be educated by the introduction of the system in this branch of trade, that channel of commerce, through this gateway of industry, at the same time advancing the fundamental conception by building for future generations on a foundation to be laid through the public educational system in the schools, colleges, and universities of the United States.

The attitude of the American people must be so made up as to want this thing before it can be made a part of the general compulsory organic law of the United States. You must first create a demand from the people; otherwise the American Congress will not listen. A bill will be accepted, referred to an appropriate committee, discussed and deliberated upon, hearings will be open to all concerned, with the ultimate result that the committee will declare that although the members are unanimously in favor of its legislation, it is wise not to report it to the main body, for two reasons: First, the Congress itself, able and intelligent in many matters, would not accept so radical a change by way of compulsory laws because there was no public demand; and, secondly, because the country, being unfamiliar with the metric system, would resent any action taken by the Congress to compel the use of that with which they were neither in accord nor understanding.

The metric system, then, if in time it is to be generally used in this country, must first be clearly understood before you attempt to compel by law the use of it. The system should be learned and made use of. You will grant that while this system has been before the country for years, it has a reputation generally for being a fad or a fancy. This impression must be removed. If, in the next generation, it can be taught to the children at the mother's knee a great advance has been made toward its adoption.

It is needless to go into the meritorious advantages of the metric system to a conference of weights and measures officials. Your experience teaches you how difficult it is to unravel present-day problems arising under our present system. You dream of and yearn for the simplicity of the metric system.

Into the work of scientific men the metric system was easily introduced. The scientific man, however, who advocates the adoption and use of the metric system must see beyond his own horizon in

these matters. Those with him in advocating the metric system are liable to create for themselves a pitfall of error. Scientific men, like other men, are subject to the limitations of human nature. Scientific men believe the change to the metric system for general use will be easy because in scientific work it was easy. The scientific use of measurement consists of measuring things. The industrial use of measurements consists in making things to certain sizes. It has been the rule that the advocates of the metric system are measurers of things, while those who generally come from the ranks of the opposition are makers of things. Now these things are at present made in our customary system unless the makers, because of commercial demands, are obliged to furnish the supply in the metric system. A change to the metric system, from the scientific man's standpoint, involves nothing but a change in measuring instruments, while the manufacturing interests of the country, the makers of things, are naturally affected to a greater degree, for they are compelled to pay the bills which come with the change. The scientist, the weights and measures official, and those engaged in a special study of the metric system, are familiar with its advantages and should now be generous and treat those liberally who are in ignorance. The primary object of the metric advocate should be to familiarize those with it who are without special interest therein.

A conspicuous example of the confusion arising from having more than one system is displayed in the building of the Panama Canal. This great twentieth century engineering feat was begun by the meter and completed by the yard.

Should the metric system come into general use in this country you must appreciate the salient and incontrovertible fact that the enthusiasm, sympathy, and intelligence which bring it about will cause new and grave problems to arise, which at that time must be treated with the same consideration as we give conditions which arise when night changes into day.

The modern advocate for the adoption and use of the metric system in the United States must have a plan—a constructive, definite, and detailed plan and program with accompanying directions. This plan should be so formulated as to arrange from time to time, year after year, for its introduction into new and virgin fields where it is now unknown or opposed. That which has already been accomplished through economic needs, foreign and export demands, through industrial efficiency, and engineering interests; that which has already been accomplished in the halls of medicine and medical practice, and in the numerous arts, sciences, and industries wherein it is now a fact, stands out to the credit of the advantages of the metric system and can be pointed to as an example for its adoption and use elsewhere. The plan should follow the permissive law of 1866, taking up the subjects and conditions which it may control, not generally, but phase by phase, situation by situation, condition by condition, trade by trade, and so on ad infinitum until the top is reached, even if it takes a generation or two to reach the goal.

It would be absurd to hope to accomplish the apparently impossible unless the field to which you expect to apply the metric system is surveyed, nurtured, and harvested through the medium of a distinct and separate plan for each particular purpose.

The project, when introduced in practical modern-day fashion, beginning at the bottom rung of the ladder, not at the top, will render to the projectors a return commensurate to the effort they put forth.

Since he may provide himself with the tools which are so ready to his hand, namely, the ancient and modern example, the history, political, financial, and economic of the world through which, strange to say, the metric system has wormed its way with curious results, good and bad, and the literature printed in all the modern languages pro and con, the missionary who goes out is well equipped for the project.

Under a plan of action well prepared and practical to bring about the adoption and use of the metric system in the United States you will have, for the first time in the history of the metric system, and more especially in this country, attempted the projection of a revolutionary change with all the prospects of success. Never before in the economic history of this country has such a plan been proposed or attempted.

A committee on the metric system, national in character, should be retained by the National Conference on the Weights and Measures of the United States from year to year. Its report might be based upon what it has been able to accomplish during the year preceding with reference to the progress made in the adoption and use of the system in the various factors of trade, commerce, industry, public education, and legislation, and the committee should be authorized to make such recommendations as are deemed necessary for the continued forwarding of the project with the cooperation of its advocates.

The plan as outlined should be definite and exact, subject, however, to changes which may be necessary which can not now be foreseen. The plan should comprise, for example, during the year 1916–17 an introduction of the metric system to commercial and industrial firms who, although not now affected by foreign-trade expansion, are within the same circle of influence as many firms who have been affected and who have adopted and are now using the metric system. So on to the end of the line, year after year, the project to be carried into the shop of the worker, instead of requiring or waiting for the worker, the pupil, to come to the teacher.

The project can not in the wildest dream of its most enthusiastic supporter expect immediate adoption and use. The road is long and difficult of travel and many and serious obstacles beset the program. While the metric system has millions of advocates in the world, our purpose is gradually to enlist the support of millions who will then commence to use it in the United States, with the ultimate aim of the destruction of the many horned species of weight-and-measure-system animals now roaming through the Nation.

We can only attain our aim by patient and persistent effort on a definite plan applied to the elements now ignorant of the metric system or opposed to it. The conditions before us may not hold promise in this generation of its universal adoption and use in the United States. The attempt to bring it about, however, in this generation through systematic effort may be rewarded by surprising results. If in this generation we are unsuccessful and have ended our labors here at the call which comes from on high, our successors may con-

tinue the spread of the gospel of weight and measure simplicity represented by the metric system with more assurances of a successful outcome in view of the coming of an expected superior intelligence with future generations, who will accept the metric system as truth and tradition, as a force to cement world relations, hand in hand with a universal language.

The metric system of weights and measures fits into the general scheme for international friendly intercourse. To that end all just men are striving. When the millennium comes the energizing forces of men will have accomplished much under the definite guidance of Almighty God if they have agreed upon a universal language and the universal use of the metric system of weights and measures.

DISCUSSION.

The CHAIRMAN. Gentlemen, you have heard the report of the chairman of the committee on the metric system. What shall we do with it?

Mr. FARRELL. I move that it be accepted with the thanks of the conference.

(The motion was seconded.)

Mr. HANSON. As I understand Mr. Hartigan to say, this was not a committee report but simply a report by himself. I happen to be a member of the committee, as is Mr. Downing, of Wisconsin, and neither of us knew anything of a report to be submitted until a few moments ago.

Mr. HARTIGAN. Before I read the report I apologized to Mr. Hanson and Mr. Downing and said that under the conditions under which I worked, with the members scattered throughout the country, it was not possible to get in touch with any of the members of the committee. If there are any features of this report to which Mr. Hanson and Mr. Downing have objections, I am willing to withdraw from the report those particular features.

Mr. HANSON. I simply want to state my position in this. I have come down to New York at various times, and have heard nothing of this committee whatsoever since I was appointed by the president of the association. I have been interested in the metric system, and naturally would have liked to have given some thought to it. Personally, I have no objection to Mr. Hartigan's report, but, as a member of the committee, I do object to it going in as a committee report.

SECRETARY'S NOTE.

At this point Mr. F. A. Halsey was given an opportunity to address the conference in opposition to the metric system of weights and measures. On account of the rapidity with which he spoke, the stenographer failed to obtain a transcript of his remarks, which were made extemporaneously. The secretary of the conference informed Mr. Halsey to this effect and invited him to submit a report in writing for inclusion in the record. Mr. Halsey replied under date of July 6, 1916, that his remarks had been "impromptu and casual—brought out by points covered by the report of the committee and

of corresponding minor importance," and continued, "I have no particular desire to see them included in your proceedings, which in fact I had not contemplated until your letter arrived." We are, therefore, unable to include them here.

Mr. JOHNSON. Mr. Chairman, is it possible to refer back to the report of the resolutions committee? If so, I have a resolution which has been overlooked.

The CHAIRMAN. Read the resolution.

Mr. JOHNSON (reading):

Resolved, That this conference extend its sympathy and encouragement to such groups of individuals who may form themselves into a metric organization, the objects of which are to advance and protect the metric system, its adoption, and use throughout the United States.

Mr. REICHMANN. I move its adoption.

(The motion was seconded and agreed to.)

The CHAIRMAN. A motion is before us with regard to Mr. Hartigan's report. You have heard the motion and the remarks. Are there any further remarks?

Mr. FARRELL. Was there a minority report or not?

The CHAIRMAN. No, sir; unless we consider Mr. Hanson's remarks as a report.

Mr. FARRELL. I would like to hear Mr. Hanson extend his remarks on the metric system either now or in writing.

The SECRETARY. As I understand it, Mr. Hanson does not object to the report but he merely said that it was not the report of the committee. He has not, so far as I know, differed from Mr. Hartigan at all.

Mr. FARRELL. Is it proper to suggest that the minority member file a minority report?

Mr. HANSON. We are not the minority. There are two of us here.

Mr. FARRELL. Then may I suggest the majority file a report on the metric system either now or at some future date?

The CHAIRMAN. The motion before us is action on this report. Those in favor say "aye"; contrary, "no." The motion carries.

Mr. GUARDIA. Mr. Chairman, there is a branch of the industry I have been connected with that does not come under the province of weights and measures, and that is the electrical industry. Knowing that I was coming to Washington, quite a few local manufacturers and people identified with the industry asked me to take up this subject of the metric system. There were quite a few cases where resistance wire is used, and some factories are measuring in the metric system and others not. I feel sure that if any committee here who favors the metric system will get in touch with the electrical industry they will get a volume of information which they do not have at the present time.

The CHAIRMAN. While this is not strictly in order, I may state that that communication Mr. Fischer read was from a member of the Institute of Electrical Engineers, and the case you have taken up is much more far-reaching than you suppose. The question of the wires, even if we should decide upon a system of measurements, is a question of whether the area or diameter should be used.

The secretary has one or two announcements to make.

QUESTIONS SUBMITTED AND REFERRED.

The SECRETARY. I want to read the following question which has been handed to me:

As city and county weights and measures officials have little benefit in conference, so far as their field work is concerned, what could be the objection to forming a sort of bureau within the conference to be composed of such officials or providing for one day's separate meeting for them to discuss field problems and exchange views?

I might suggest the best way to dispose of that would be to refer it to the executive committee in order that they may have it in mind when the program is being made up.

Mr. FARRELL. I move this disposition of the question.

(The motion was seconded and agreed to.)

The SECRETARY. The next question is as follows:

Should there not be a general specification for the bushel basket used in the sale of all commodities?

Mr. FARRELL. I move that that be referred to the committee on tolerances and specifications.

(The motion was seconded and agreed to.)

REPORT OF THE TREASURER, JOHN T. WILLETT, CHIEF STATE INSPECTOR OF WEIGHTS AND MEASURES OF INDIANA.

GENTLEMEN: I herewith submit my annual report as treasurer for the year ended May 22, 1916:

Receipts:		
May 28, 1915, from J. H. Sherman, chairman committee on entertainment	$23.35	
Aug. 16, 1915, from F. S. Holbrook, chairman committee on lunch at Bureau	4.75	
		$28.10
Disbursements:		
June 5, 1915, to the Westminster Press, for printing 300 badges	3.00	
June 5, 1915, messenger service from Raleigh Hotel to Bureau	.75	
		3.75
Balance on hand May 22, 1916		24.35

Respectfully submitted,

JOHN T. WILLETT, *Treasurer.*

The CHAIRMAN. That is all of the business we have before us now.

Mr. FARRELL. I move you, Mr. Chairman, that we adjourn.

(The motion was seconded and agreed to, and the conference, at 1 o'clock p. m., adjourned.)

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APPENDIX 1

SPECIFICATIONS AND TOLERANCES FOR WEIGHTS AND MEASURES AND WEIGHING AND MEASURING DEVICES AS ADOPTED BY THE ELEVENTH ANNUAL CONFERENCE AND RECOMMENDED BY THE BUREAU OF STANDARDS FOR ADOPTION BY THE SEVERAL STATES

(The paper constituting this appendix has been issued also as Bureau of Standards Circular No. 61. For discussion of the specifications and tolerances, see page 127 et seq. of the Conference Report.)

SPECIFICATIONS AND TOLERANCES FOR WEIGHTS AND MEASURES AND WEIGHING AND MEASURING DEVICES

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I. APPLICATION OF SPECIFICATIONS AND TOLERANCES

These tolerances and specifications are to be construed to apply to the usual types of weights and measures and weighing and measuring devices used in ordinary commercial transactions or usually coming within the jurisdiction of the weights and measures official, but only when a proper classification is herein provided for them. They shall also be construed to apply to apparatus used for special purposes, whenever and in so far as they are clearly applicable, but not otherwise.

II. CLASSIFICATION OF SPECIFICATIONS

The following specifications on weights and measures and weighing and measuring devices shall be divided into two sets, the first to be retroactive and to apply to all apparatus immediately upon adoption of the specifications, the second to apply only to new apparatus.

For the purpose of administration the following classes of apparatus are established.

Class 1. Weights and measures and weighing and measuring devices which, after the promulgation of these specifications, are manufactured in the State or brought into the State.

Class 2. Weights and measures and weighing and measuring devices which are in the State at the time of promulgation of these specifications, either in use, or in the stock of manufacturers of, or dealers in, such apparatus.

All the specifications shall apply to apparatus of class 1.

The specifications printed in italics shall not apply to apparatus of class 2, and therefore shall not be retroactive.

III. LINEAR MEASURES

Specifications.—1. Measures of length shall be made of a material the form and dimensions of which remain reasonably permanent under normal conditions—for example, steel, brass, hardwood, etc.: Provided, however, That tapes for commercial purposes may be made of cloth, but only when this is wire-woven, and when by this means an actual and sufficient reinforcement and permanency is obtained.

2. The ends of measures of length made of wood, or of other nonmetallic material liable to wear away through use, shall be protected by some metal not softer than brass, firmly attached to the measure.

3. Rigid measures of length shall be smooth and straight.

4. Folding measures of length shall be so constructed that each section will come to a definite stop when straightened out.

5. Measures of length shall be graduated in units of the customary system and its usual subdivisions.

6. All graduations shall be clear and distinct and the main graduations shall be plainly designated. The length of these main graduations shall be greater than that of the intermediate graduations, and the latter shall be varied in length in such a way that they may be conveniently read.

7. Graduations shall not be greater in width than one-quarter of the width of the smallest subdivision: Provided, however, That if line graduations are employed, their width shall not exceed 0.03 inch; if raised graduations are employed, their width shall not exceed 0.12 inch at their widest point.

8. All graduations shall be uniformly spaced and be perpendicular to the edge of the measure.

9. Measures of length, so called, defined by tacks driven into a counter, or in any similar way, shall not be allowed.

Tolerances.—The tolerances to be allowed in excess or deficiency on all measures of length except tapes of steel or other metal shall not be greater than the following values: Provided, however, That the manufacturers' tolerances or the tolerances to be allowed on all new measures of length, except tapes of steel or other metal, shall not be greater than one-half of the values given.

Length	Tolerance
Feet	Inch
6.....	3/16
5.....	5/32
4.....	1/8
3.....	3/32
2.....	1/16
1.....	1/32
1/2 [1]....	1/64

[1] Or less.

The tolerances to be allowed in excess or deficiency on all tapes of steel or other metal shall not be greater than the following values:

Length	Tolerance	Tension
Feet	Inch	Pounds
100.....	1/4	10
66.....	3/16	10
50.....	1/8	10
33.....	3/32	10
25.....	1/16	10
10.....	1/16	5
6.....	1/32	5
3.....	1/32	5

IV. LIQUID CAPACITY MEASURES

Specifications.—1. Liquid measures shall be made of metal, glass, earthenware, enameled ware, composition, or similar and suitable material, and shall be of sufficient strength and rigidity to withstand ordinary usage without becoming bent, indented, distorted, or otherwise damaged: *Provided, however, That when the measure is made of iron or steel, or iron or steel plated with tin, zinc, or copper, or is made of copper, the minimum thicknesses of the metal shall in no case be less than those given in the following table:*

Capacity of measure	Minimum thickness if of iron or steel or of plated iron or steel [1]	Minimum thickness if of copper
	Inch	Inch
Over 1 gallon	0.016	0.032
1 gallon	.014	.028
½ gallon	.014	.028
1 quart	.014	.028
1 pint or less	.010	.020

[1] The following commercial tin plates will comply with these requirements: Over 1 gallon, 2XL; 1 gallon, ½ gallon, and 1 quart, IX; 1 pint or less, ICL.

2. Liquid measures of the customary system shall be of one of the following capacities only: One gallon, a multiple of the gallon, or a binary submultiple of the gallon; that is, a measure obtained by dividing the gallon by the number 2 or by a power of the number 2: Provided, however, That nothing in this specification shall be construed to prevent the use of forms for ice cream, exclusively, in 5-pint and 3-pint sizes, or bottles for milk or cream in the 3-pint size.

3. Liquid measures shall be so constructed that the capacity is determined by a definite edge, plate, bar, or wire at or near the top of the measure. When one of the last three forms is employed the capacity shall be determined to the lowest point of such plate, bar, or wire.

4. No subdivided liquid measures shall be allowed, and the only reinforcing rings which may be used are those which are firmly attached to the outside of the measure and do not, by indentations or in any other manner, show divisions or lines on the inside surface of the measure.

5. *The capacity of the measure shall be conspicuously, legibly, and permanently indicated on the side of the measure. This shall be in combination with the word "Liquid" or the letters "Liq" in the case of measures in which the word "quart" or "pint" occurs. In the case of measures made of earthenware, enameled ware, or composition, this marking shall be of a different color than the measure.*

6. If a liquid measure is provided with a tap or spigot, the construction shall be such that the measure may be completely emptied by the tap or spigot while it is standing upon a level surface.

7. When a lip or rim, designed both to facilitate pouring and to receive any overflow, is provided, the measure must be so constructed as to hold its full capacity exclusive of the lip or rim, while it is standing upon a level surface.

Tolerances.—The tolerances to be allowed in excess and in deficiency on all liquid capacity measures shall not be greater than the following values: Provided, however, That the manufacturers' tolerances or the tolerances to be allowed on all new liquid capacity measures, shall not be greater than one-half of the values given.

Capacity of measure	Tolerance			
	In excess		In deficiency	
	Liquid ounces	Cubic inches	Liquid ounces	Cubic inches
10 gallons	10	18.0	5.0	9.0
5 gallons	6	11.0	3.0	5.4
4 gallons	4	7.0	2.0	3.6
3 gallons	4	7.0	2.0	3.6
2 gallons	2	3.5	1.0	1.8
			Drams	
1 gallon	1	1.8	4.0	.9
	Drams			
½ gallon	6	1.4	3.0	.7
1 quart	4	.9	2.0	.5
1 pint	3	.7	1.5	.3
½ pint	2	.4	1.0	.2
1 gill	2	.4	1.0	.2

GLASS GRADUATES.

Specifications.—*1. Graduates shall be made to contain or to deliver the indicated volume at 20° C (68° F). They shall be legibly, conspicuously, and permanently marked to indicate whether they are graduated to contain or to deliver.*

2. Graduates shall be either cylindrical or conical in shape. In the case of all cylindrical graduates the ratio of length of the graduated scale to the internal diameter shall not be less than five to one. In the case of conical graduates the ratio of length of the graduated scale to the internal diameter at the highest graduation shall not be less than two to one, and at one-fourth of the total capacity this ratio shall not be less than one to one.

3. Graduates shall be made of good quality glass, thoroughly annealed, clear, transparent, of uniform but not excessive thickness, and free from bubbles and streaks.

4. Graduates shall be provided with a base at right angles to the axis *and of such a diameter that the graduate will stand when placed on a surface making an angle of 25 per cent, or approximately 15°, with the horizontal.*

5. All graduates shall be provided with pouring lips.

6. The graduation marks shall be perpendicular to the axis, and parallel to the base and to each other.

7. The graduation marks shall be varied in length in such a manner that they may be conveniently read, *but in no case shall any graduation mark extend less than one-fourth of the distance around the graduate. The main graduation marks shall extend at least one-half of the distance around the graduate: Provided, however, That on duplex, or double-scale, graduates a clear space shall be left between the ends of the main graduation marks on the two scales, and this space, measured parallel to the graduation marks, shall conform to the following values:*

Circumference of graduate at the graduation marks	*Distance between ends of graduation marks*
	Inch
Up to 5 inches	1/8
From 5 inches to 10 inches, inclusive	1/4
More than 10 inches	3/8

8. Graduation marks shall be clear and distinct and uniform in character. They shall be etched or engraved, *and shall not exceed 0.015 inch (0.38 mm) in width.* Blown or pressed graduation marks shall not be allowed.

9. *The clear interval between the graduation marks shall not be less than 0.04 inch (1 mm).*

10. The value of the main graduation marks shall be plainly designated, *each number being placed either directly upon or immediately above the graduation mark to which it refers,* but the position of the numbers shall be consistent throughout the graduated scale. *If placed upon the graduation marks, the numbers shall be placed from the ends a sufficient distance to allow the ends to be used in making a setting. Intermediate graduation marks shall not be numbered.*

11. *On all single-scale graduates, where the main graduation marks do not completely encircle the graduate, the middle points of the main graduation marks shall be directly opposite the lip. On duplex, or double-scale, graduates the center of the clear spaces between the ends of the main graduation marks, provided for in specification 7, shall be approximately 90° from the lip.*

Tolerances.—The tolerances to be allowed in excess or deficiency on glass graduates shall not be greater than the values given in the following table.

NOTE.—The tolerance to be used at any point on any graduate shall be determined by measuring the inside diameter of the graduate at the point under test and taking from the table the tolerance value corresponding to this diameter.

Tolerance for Graduates of Various Diameters (in Metric Units)

Diameter	Tolerance	Diameter	Tolerance	Diameter	Tolerance
mm	ml [1]	mm	ml [1]	mm	ml [1]
10.....	0.04	45.....	1.10	80.....	4.5
11.....	.05	46.....	1.15	81.....	4.6
12.....	.06	47.....	1.25	82.....	4.8
13.....	.07	48.....	1.30	83.....	4.9
14.....	.08	49.....	1.35	84.....	5.0
15.....	.09	50.....	1.4	85.....	5.1
16.....	.10	51.....	1.5	86.....	5.2
17.....	.12	52.....	1.6	87.....	5.4
18.....	.14	53.....	1.6	88.....	5.5
19.....	.16	54.....	1.7	89.....	5.6
20.....	.18	55.....	1.8	90.....	5.7
21.....	.20	56.....	1.9	91.....	5.9
22.....	.22	57.....	2.0	92.....	6.0
23.....	.24	58.....	2.0	93.....	6.1
24.....	.26	59.....	2.1	94.....	6.2
25.....	.28	60.....	2.2	95.....	6.4
26.....	.30	61.....	2.3	96.....	6.5
27.....	.35	62.....	2.4	97.....	6.6
28.....	.35	63.....	2.5	98.....	6.8
29.....	.40	64.....	2.6	99.....	6.9
30.....	.45	65.....	2.7	100.....	7.1
31.....	.45	66.....	2.8		
32.....	.50	67.....	2.9		
33.....	.55	68.....	3.0		
34.....	.60	69.....	3.1		
35.....	.60	70.....	3.2		
36.....	.65	71.....	3.4		
37.....	.70	72.....	3.5		
38.....	.75	73.....	3.6		
39.....	.80	74.....	3.7		
40.....	.85	75.....	3.9		
41.....	.90	76.....	4.0		
42.....	.95	77.....	4.1		
43.....	1.00	78.....	4.2		
44.....	1.05	79.....	4.4		

[1] The term milliliter, or "ml," is used herein to designate the one-thousandth part of the liter. This unit is also commonly known as the cubic centimeter, or the "cc." The latter is not an accurate usage, as the units are not exactly equal, but the difference between them is of no consequence for the purposes of this table and therefore they may be used interchangeably.

Tolerance for Graduates of Various Diameters (in U. S. Customary Units)

Diameter		Tolerance		Diameter		Tolerance	
Inches	Sixteenths	Drams	Minims	Inches	Sixteenths	Drams	Minims
..	6	..	0.6	2	4	..	32
..	7	..	.8	2	5	..	34
..	8	..	1.0	2	6	..	36
..	9	..	1.3	2	7	..	39
..	10	..	1.6	2	8	..	41
..	11	..	2.0	2	9	..	44
..	12	..	2.5	2	10	..	47
..	13	..	3.0	2	11	..	49
..	14	..	3.5	2	12	..	52
..	15	..	4.0	2	13	..	55
1	0	..	5	2	14	..	58
1	1	..	6	2	15	1	2
1	2	..	6	3	0	1	5
1	3	..	7	3	1	1	8
1	4	..	8	3	2	1	12
1	5	..	9	3	3	1	15
1	6	..	10	3	4	1	18
1	7	..	11	3	5	1	21
1	8	..	12	3	6	1	24
1	9	..	14	3	7	1	27
1	10	..	15	3	8	1	31
1	11	..	16	3	9	1	34
1	12	..	17	3	10	1	38
1	13	..	19	3	11	1	41
1	14	..	21	3	12	1	44
1	15	..	22	3	13	1	47
2	0	..	24	3	14	1	51
2	1	..	26	3	15	1	55
2	2	..	28	4	0	2	0
2	3	..	30				

MEASURING PUMPS

Specifications.—*1. When a measuring pump is provided with adjustable stops, the construction shall be such that each stop can be separately sealed in such a manner that its position can not be changed without destroying the seal.*

2. When a measuring device is provided with a graduated or notched scale to indicate the amount to be delivered, this scale shall be riveted or otherwise permanently fixed in position.

3. The amounts delivered shall not vary by more than the tolerance allowed, irrespective of the speed with which the pump is operated and of the time elapsing between operations.

Tolerances.—The tolerances to be allowed in excess and in deficiency shall not be greater than the values given for the liquid measure of corresponding capacity and kind in the preceding tolerance table for liquid measures.

MILK BOTTLES

Specifications.—1. Bottles used for the sale of milk or cream shall be made only in sizes heretofore specified under the heading "Liquid Capacity Measures," and they shall be made to contain their indicated capacities at a temperature of 20° C (68° F).

2. *Each bottle shall have its capacity clearly blown or otherwise clearly and permanently marked in or on the side of the bottle, and in or on the side or bottom the name, initials, or trade-mark of the manufacturer thereof.*

3. Glass bottles with an inside diameter of not over 2 inches immediately below the cap-seat or stopple shall hold the correct capacity when filled to within one-fourth inch of this cap-seat or stopple; bottles with an inside diameter of over this amount immediately below the cap-seat or stopple shall hold the correct capacity when filled to within one-eighth inch of this cap-seat or stopple: Provided, however, That a larger distance shall be allowed below the cap-seat or stopple when the bottles are provided with a clearly defined line blown or otherwise clearly and permanently marked in or on the bottle, and extending at least half-way around it, which indicates the correct capacity, and directly over, below, or beside this line, with the words "Fill to line" or a similar and suitable inscription clearly and permanently marked in or on the bottle. The distance between the line herein mentioned and the cap-seat or stopple shall in no case exceed that given in the table below.

Capacity of bottle	Maximum distance allowable
	Inches
2 quarts	2
3 pints	1¾
1 quart	1½
1 pint	1
½ pint	5/8
1 gill	5/8

Tolerances.—The tolerances to be allowed in excess or deficiency on individual bottles, and on the average capacity of bottles, shall not be greater than the values shown in the following table. The error on the average capacity of bottles shall be determined by finding the error on each of not less than 25 bottles selected at random from at least four times the number tested, and taking the algebraic mean of these errors.

NOTE.—To find the algebraic mean of a number of errors, first add all those errors which are in excess; then add all those errors which are in deficiency; then subtract the smaller sum from the larger; and finally divide this result by the total number of bottles tested.

Capacity of bottle	Tolerance on individual bottles		Tolerance on average capacity	
	Drams	Cubic inches	Drams	Cubic inches
½ gallon	6	1.4	1.5	0.35
3 pints	5	1.2	1.25	.29
1 quart	4	.9	1.0	.23
1 pint	3	.7	.75	.17
½ pint	2	.5	.5	.12
1 gill	2	.5	.5	.12

V. DRY CAPACITY MEASURES

Specifications.—1. Dry capacity measures, and baskets used as dry measures, shall be made of metal, well-dried wood, or composition, or similar and suitable material, and shall be of sufficient strength and rigidity to withstand ordinary usage without becoming materially warped, bent, dented, distorted, or otherwise damaged.

2. Dry measures, and baskets used as dry measures, when such are allowed by the other specifications, shall be of one of the following capacities only: One bushel, a multiple of the bushel, or a binary submultiple of the bushel; that is, a measure obtained by dividing the bushel by the number 2 or by a power of the number 2.

3. The capacity of all dry measures, and baskets used as dry measures, shall be conspicuously, legibly, and permanently indicated on the side of the measure. This shall be in combination with the word "Dry" in the case of measures in which the word "quart" or "pint" occurs. The letters shall be at least one-half inch high and one-

quarter inch wide on measures having a capacity of 1 peck or less, and at least 1 inch high and one-half inch wide on those having a capacity of one-half bushel or more.

4. All dry measures having a capacity of one-half bushel or less shall be cylindrical or conical in shape. If of the latter shape, the top diameter shall be greater than the bottom diameter, but never by an amount exceeding 10 per cent of the latter. In no case shall the bottom diameter exceed the top diameter.

5. The bottoms of all dry measures shall be perpendicular to the axis of the measure and shall be flat, or when made of metal may be slightly corrugated when such corrugations aid in strengthening the measure. Such corrugations, when employed, shall be parallel or radial straight lines only.

6. Wooden dry measures having a capacity of more than 1 pint shall have a metal band firmly attached around the top. All metal dry measures shall be adequately reinforced around the top.

7. Dry measures, and baskets used as dry measures, having a capacity of 1 bushel or more shall be equipped with handles.

8. Baskets shall not be used as dry measures when having a capacity of less than one-half bushel.

9. Dry measures, and baskets used as dry measures, shall be of such construction that the capacity is determined by the top rim of the measure, and no subdivided measures or baskets shall be allowed.

10. Dry measures shall not be double-ended; that is, have the bottom set part way up into the measure so that both ends may be utilized as measures, either of the same or of different capacities.

11. Dry measures, and baskets used as dry measures, shall not have adjustable or movable bottoms.

12. The minimum diameters of dry measures of various capacities shall conform to the following table:

Capacity of measure	Minimum diameter
	Inches
½ bushel	13¾
1 peck	10⅞
½ peck	8½
2 quarts	6⅝
1 quart	5⅜
1 pint	4

Tolerances.—The tolerances to be allowed in excess and in deficiency on dry capacity measures and baskets used as dry capacity measures shall not be greater than the following values: Provided, however, That the manufacturers' tolerances or the tolerances to be allowed on all new dry capacity measures and baskets used as dry capacity measures shall not be greater than one-half of the values given:

Capacity of measure	Tolerance	
	In excess	In deficiency
	Cu. in.	Cu. in.
1 bushel	50.0	25.0
½ bushel	30.0	15.0
1 peck	16.0	8.0
½ peck	10.0	5.0
2 quarts	5.0	2.5
1 quart	3.0	1.5
1 pint	2.0	1.0
½ pint	1.0	.5
¼ pint	.5	.3

BERRY BASKETS OR BOXES

Specifications.—1. Baskets or boxes for berries or small fruits, of a capacity of 1 dry quart or less, shall be of one of the following sizes: One quart, 1 pint, or one-half pint, dry measure.

Tolerances.—The tolerances to be allowed in excess or deficiency, on baskets or boxes for berries or small fruits, constructed of wood, shall not be greater than the following values:

Capacity of basket	Tolerance	
	In excess	In deficiency
	Cu. in.	Cu. in.
1 quart	3	1.5
1 pint	2	1.0
½ pint	1	.5

The tolerances to be allowed in excess or deficiency, on baskets or boxes for berries or small fruits, constructed of pasteboard or fiber, shall not be greater than the following values:

Capacity of basket	Tolerance	
	In excess	In deficiency
	Cu. in.	Cu. in.
1 quart	2. 0	1. 0
1 pint	1. 0	. 5
½ pint	. 5	. 25

VI. SCALES

General specifications.—1. The nominal or rated capacity of a scale is the largest weight indication which can be obtained by the use of all its reading or recording elements in combination.

When one reading or recording element of the scale is designed for auxiliary use only, such as a small bar and poise intended for use in determining weights intermediate between two graduations on the principal bar of the beam, the weight value of this reading or recording element need not be included in the sum, provided that it does not exceed 2 per cent of the sum of the weight values of the remaining reading or recording elements. (Thus, a platform scale with the principal bar of the beam graduated to 100 000 pounds by 1000-pound subdivisions and with an auxiliary bar graduated to 1000 pounds by 20-pound subdivisions may be considered as having a nominal capacity of 100 000 pounds.)

When a scale is designed for use with removable weights and these are furnished with the scale, the amount which these represent when used on the scale shall be included in the sum of the weight values of the reading elements. When the scale is designed for use with removable weights, but these are not furnished with the scale, the amount which those represent on the scale that are usually furnished with the scale when weights are included, shall be included in the sum of the weight values of the reading elements.

2. *All scales not equipped with a beam or reading face graduated to the full capacity of the scale, or those not equipped with a graduated beam or reading face, which, taken in connection with another*

graduated beam or beams or with a graduated runner, indicates the capacity of the scale, shall have the nominal or rated capacity conspicuously, clearly, and permanently marked upon them.

2a. No scale shall be used in weighing loads greater than its nominal or rated capacity.

3. All scales shall be of such construction that they will support a load of maximum capacity without undue bending or straining of the parts.

3a. The construction of all scales shall be such that when the beam is displaced to the full extent allowed by the construction of the scale, it will return to its normal position.

4. All knife-edges shall be firmly secured to the levers.

5. All knife-edges shall be of hardened and tempered steel. They shall be sharp and bear throughout the entire length of the parts designed to be in contact.

6. All bearings shall be smooth and at least as hard as the knife-edges. For scales of more than 5000 pounds capacity, the bearings shall be made of hardened and tempered steel. (The term "bearing" used in this paragraph refers to the entire surface which is designed to be in contact with the edge of a knife-edge or with a point bearing.)

7. When plates or caps are used to limit the longitudinal motion of a knife-edge, the parts of such plates or caps which are liable to come into contact with the knife-edge shall be smooth and at least as hard as the knife-edge. The parts of the knife-edge liable to come into contact with these plates or caps shall be so formed that the friction between them is reduced to a minimum.

8. If a scale has a nose-iron, the position of this at the time of installation of the scale shall be clearly and accurately indicated.

9. If the scale has interchangeable or reversible parts, these shall be so constructed that their interchange or reversal will not affect the balance or the accuracy of the instrument.

10. No scale shall be equipped with a scoop counterbalanced by a removable poise or weight.

11. When the scale is equipped with a permanently attached device intended to counterbalance the weight of a removable scoop, this device shall clearly indicate on the customers' side of the scale whether the scoop should be on or off the scale.

12. The graduations on all beams shall consist of lines, or notches, or of a combination of these. All lines shall be uniform in spacing and parallel to each other. All notches shall be evenly

cut, and the lines formed by the intersection of the sloping planes of their sides must be uniform in spacing and parallel to each other. When a combination of lines and notches are employed, the lines must be properly placed with reference to the notches so as to indicate the value of each notch clearly and correctly.

12a. The graduations on all beams and reading faces shall be clear and distinct *and in no case shall their width be less than 0.008 inch.*

12b. The clear interval between the graduations on all beams shall not be less than 0.04 inch.

13. Each main weight graduation on a beam shall be so marked as to indicate the weight represented by the poise at that point.

14. Shoulders or stops shall be provided on all beams to prevent the poise traveling and remaining back of the zero graduation.

15. The adjusting material in all poises shall be securely inclosed and firmly fixed in position. If of lead or other material softer than brass, it shall not be in contact with the beam.

16. Poises shall be so constructed that no part can be easily detached, and if equipped with a set screw, this shall not be removable.

17. Poises on notched beams shall be provided with a pawl or other device, so constructed as to cause the poises to be seated into a definite and correct position in each notch, wherever in the notch the pawl or other device is placed, and to be held there firmly and without appreciable movement.

18. The bearing edge of a hanging poise shall be hard and sharp, and shall be so formed as to allow the poise to swing freely in the notches of the beam.

19. Reading edges or indicators of poises shall be sharply defined, and all reading edges shall be parallel to the graduations on the beam.

20. Poises shall not be readily detachable from the beam: Provided, however, That this specification shall not apply to poises on steelyards unless there is a zero graduation on the beam.

21. When scales are equipped with a beam, the position or oscillation of which is used to indicate the balance of the scale, the normal position of this beam shall be horizontal, and it shall have equal play above and below the normal horizontal position.

22. No scale shall be so constructed that the beam is unstable or accelerating.

23. Scale pans in which fish or other wet commodities are placed when weighed shall be so constructed as to provide for drainage.

23a. All scales shall give correct weight indications whether the load is being increased or decreased.

23b. All devices intended to increase or decrease the capacity of a scale by the addition or subtraction of a weight or weights shall operate properly irrespective of the speed with which they are manipulated.

24. All scales shall be of such construction that they are reasonably permanent in their adjustment and will repeat their weight indications correctly, and are not designed to, or may not be used to facilitate the perpetration of fraud.

25. All scales shall be in balance.

A scale is in balance, as the term is used herein, when it correctly gives a weight indication of zero, when there is no load on the platform, plate, pan, or scoop.

A lever scale of the nonautomatic type not having an indicator and a graduated scale or arc, is in balance when the beam comes to rest at, or oscillates through approximately equal arcs above and below, the center of the trig-loop when one is provided; or a position midway between other stops when these are provided; or a horizontal position when no trig-loop or other stops are provided.

A scale of the nonautomatic type having an indicator and a graduated scale or arc, is in balance when the indicator comes to rest at, or oscillates through progressively smaller arcs about, a definite and clear zero graduation.

A scale of the automatic type—that is, one having a reading face or dial—is in balance when the indicator comes to rest at a definite and clear zero graduation.

Sensibility reciprocal.—The term "sensibility reciprocal" hereinafter referred to is defined as the weight required to move the position of equilibrium of the beam, pan, pointer, or other indicating device of a scale a definite amount, at the capacity or at any lesser load, the effect of friction in causing inconstancy of this position of equilibrium being eliminated.

In scales provided with a beam and trig-loop, the sensibility reciprocal is the weight required to be placed upon the platform to turn the beam from a horizontal position of equilibrium in the middle of the trig-loop to a position of equilibrium at the top of the loop, the effect of friction being eliminated as above. The sensibility reciprocal may be determined by subtracting the weight

instead of adding it, thereby causing the beam to assume a position of equilibrium at the bottom of the loop; or indirectly, by moving the sliding poise on the beam the required amount in either direction, to obtain the specified change in the position of equilibrium of the beam; or by adding or subtracting small weights to or from the counterpoise until the specified change is obtained, and determining the equivalent of the small weights used, in terms of weight on the platform.

In the case of equal-arm scales and scales with a single pan or plate above, or hanging from, the beam, which are not provided with a pointer moving over a graduated arc or scale, the sensibility reciprocal is the amount of weight required on the pan or plate to cause it to move from its position of equilibrium, when the scale is in balance, to a position of equilibrium at the limit of its motion.

In the case of scales provided with a single indicator and a graduated scale or arc, one of which oscillates with reference to the other to form a convenient means of determining the position of equilibrium of the beam, and which does not of itself directly indicate in terms of weight, the sensibility reciprocal is the weight required to cause a change in the position of rest of the pointer equal to one division of the graduated scale or arc.

In the case of scales equipped with two indicators which move in opposite directions and oscillate with reference to each other to form a convenient means for determining the position of equilibrium of the beam, the sensibility reciprocal is the weight required to cause a separation of the indicators of 0.04 inch.

NOTE.—The two preceding paragraphs are limited to apply only to cream-test or butter-fat-test scales and apothecaries' prescription scales, but they are included here for the sake of completeness of the definition.

The sensibility reciprocal does not apply to reading faces or dials which indicate directly in terms of weight; but no such reading face or dial which is purely auxiliary to the scale mechanism—such as one, for instance, which may or may not be employed in the determination of weight—shall be construed to exempt a scale from the sensibility reciprocal requirement, when this face or dial is detached.

NOTE.—The effect of friction on a scale is to make possible a variation of the load on the pan, plate, or platform without any corresponding change in the indication. The value of the sensibility reciprocal which is determined with the effect of friction present will, therefore, be in error by a variable amount. However, in making tests this error must be neglected.

PLATFORM SCALES

Definitions.—A platform scale is a scale having a load-receiving platform carried on multiplying levers which transmit the load to the beam or other reading element, such platform having four or more lines of support comprised in bearings which rest directly upon knife-edges in the multiplying levers.

A counter platform scale is a scale of the above type which is especially adapted on account of its compactness, light weight, moderate capacity, and arrangement of parts, for use upon a counter or table. Within the meaning of this definition, a platform scale is a counter platform scale when it conforms to both of the following:

(1) Its weighing capacity is not more than 400 pounds.

(2) Its beam or other reading element is located at an elevation sufficiently low in relation to the weighing platform to be accessible and easily read when the scale is used upon an elevated table or counter.

Specifications.—1. The foundations of all built-in scales shall be firm and substantial.

2. Platform scales having an outside frame around the platform shall be equipped with means for centering and checking the platform. These shall cause the platform bearings to return to their normal line of contact on the knife-edges when the platform is displaced to the full extent allowed and also shall prevent the platform bearings from such a displacement that the centering will not take place. The above results may be obtained by any proper means that will not introduce excessive friction and will not cause binding when the parts have been so caused to return to their normal weighing positions.

3. Platform scales shall be so constructed that there is sufficient clearance between the platform and the frame to allow for any expansion due to weather effects. Sufficient clearance shall also be provided to prevent the live parts of the scale from binding on account of an ordinary accumulation of dirt or other ordinary causes.

4. A wagon scale should have at least 12 feet of straight driveway on either end of the scale in the same plane as the platform.

5. Platforms and levers shall be of sufficiently rigid construction that the degree of deflection under the maximum load will not endanger the accuracy of the scale.

6. If a scale is equipped with a relieving device, this shall be so constructed that when the beam is balanced and the device is used to relieve it and engage it again, one or more times, the former balance will again be assumed by the beam.

7. *When corner platform loops are removable, each shall be so marked or shaped as to identify it with its proper corner.*

7a. The maximum value of the minimum graduations of the graduated beams of counter platform scales used in the sale of foodstuffs at retail shall be 1 ounce: Provided, however, That this shall not apply to scales used exclusively in the sale of vegetables.

8. All devices for adjusting the balance of a counter platform scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely separate from the movable mechanism of the scale itself, such as a screw-driver, wrench, etc., but not an adjusting pin.

9. All devices for adjusting the level of a counter platform scale shall be of such construction that they are operative or accesssible only by the use of some tool or device which is outside of and entirely separate from the leveling devices, such as a screw-driver, wrench, etc., but not an adjusting pin.

9a. Counter platform scales whose weight indications are changed by an amount greater than one-half the tolerance allowed, when set in any position on a surface making an angle of 5 per cent or approximately 3 degrees with the horizontal, shall be equipped with a device which will indicate when the scale is level, and in no case shall any pendulum operating the scale be considered a leveling device. The scale shall be rebalanced at zero each time its position is altered during this test.

10. All platform scales, except track scales, shall be so constructed that when a load consisting of test weights representing one-half or more than one-half of the capacity of the scale, and not exceeding such capacity, is placed so that its center of gravity lies over the points designated by circles in diagram No. 1, the error at each point shall not exceed the tolerance allowed for the load employed. If a load equal to one-quarter of the capacity is used, this shall be placed so that its center of gravity lies directly

over the platform bearings designated by the circles in diagram No. 2, and the errors shall not exceed those indicated above.

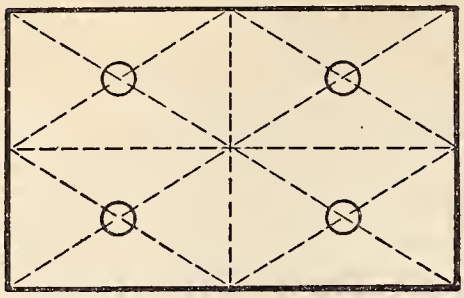

Diagram No. 1.

Diagram No. 2.

11. Any device for altering the sensibility of the scale shall be so limited in its adjustment that the beam can not be made unstable by the manipulation of the device.

12. The minimum travel of the beam in the trig-loop shall conform to the following table:

Length of beam [1]	*Minimum travel of beam in trig-loop*
	Inch
Under 12 inches	*0.4*
Over 12 inches, including 20 inches	*.5*
Over 20 inches, including 40 inches	*.7*
Over 40 inches	*.9*

[1] The "length of beam" refers to the distance from the fulcrum to the trig-loop.

13. All weighing beams shall be so marked and graduated and all poises on these beams shall be so constructed that the weight corresponding to any position of the poise can be read directly on the beam. This condition shall be fulfilled whether a registering or stamping device is used or not.

14. When not modified by the above, the specifications given under the heading "Scales: General specifications" shall apply to platform scales in so far as they are applicable.

Sensibility reciprocal.—The maximum sensibility reciprocal allowable on all platform scales, except counter platform scales, shall not exceed the value of two of the minimum graduations on the beam at the capacity of the scale or at any lesser load: Provided, however, That the manufacturers' maximum sensibility

reciprocal or the maximum sensibility reciprocal on all new platform scales, except counter platform scales, shall not exceed the value of one of the minimum graduations on the beam at the capacity or at any lesser load. The maximum sensibility reciprocals for counter platform scales are given hereafter under the heading "Counter balances and scales."

(The term "sensibility reciprocal" means the weight required to move the position of equilibrium of the beam, pan, pointer, or other indicating device of a scale a definite amount. In scales provided with a beam and trig-loop the sensibility reciprocal is the weight required to be placed upon the platform to turn the beam from a horizontal position of equilibrium in the middle of the trig-loop to a position of equilibrium at the top of the loop. The sensibility reciprocal may be determined by subtracting the weight instead of adding it, thereby causing the beam to assume a position of equilibrium at the bottom of the loop; or indirectly, by moving the sliding poise on the beam the required amount in either direction, to obtain the specified change in the position of equilibrium of the beam; or by adding or subtracting small weights to or from the counterpoise until the specified change is obtained, and determining the equivalent of the small weights used, in terms of weight on the platform.)

Tolerances.—The tolerances to be allowed in excess or deficiency on all platform scales, except counter platform scales, shall not be greater than the values shown in the following table: Provided, however, That the manufacturers' tolerances or the tolerances on all new platform scales, except counter platform scales, shall not be greater than one-half of the values given: And provided further, That these tolerances on all these platform scales shall in no case be less than the value of one of the minimum graduations on the beam, except that the manufacturers' tolerances or the tolerances on new apparatus shall in no case be less than the value of one-half of one of the minimum graduations on the beam. The tolerances for counter platform scales are given hereafter under the heading "Counter balances and scales."

Load	Tolerance, Class A		Tolerance, Class B	
	On ratio	On beam	On ratio	On beam
Pounds	Ounces	Ounces	Ounces	Pounds
50	½	1	.....	.....
100	1	2	.....	.....
200	2	4	.....	.....
240	3	6	.....	.....
300	3	6	.....	.....
400	4	8	.....	.....
500	5	10	10	1¼
600	6	12	12	1½
		Pounds	Pounds	
800	8	1	1	2
1000	8	1	1	2
1200	10	1¼	1¼	2½
1500	12	1½	1½	3
1800	14	1¾	1¾	3½
	Pounds			
2000	1	2	2	4
2500	1¼	2½	2½	5
4000	2	4	4	8
6000	3	6	6	12
8000	4	8	8	16
10 000	5	10	10	20
12 000	6	12	12	24
16 000	8	16	16	32
20 000	10	20	20	40
24 000	12	24	24	48
30 000	15	30	30	60
40 000	20	40	40	80
80 000	40	80	80	160
100 000	50	100	100	200
160 000	80	160	160	320
200 000	100	200	200	400
300 000	150	300	300	600
400 000	200	400	400	800

Explanation of Preceding Table.—"Class A" scales include the following: Scales of the portable platform type; and also scales of the dormant type which are installed inside of a building having side walls and roof, which protect the scale from weather effects and from sudden changes of temperature.

"Class B" scales include the following: Scales of the railroad track and wagon types; and also scales of the dormant type which

are not installed inside of a building having side walls and roof, and which are exposed to weather effects and sudden changes of temperature.

NOTE.—The latter effect, since it causes the condensation of moisture on the scale parts, often has as serious results on the condition of the scale as have weather effects.

The columns with the heading "Tolerance on ratio" refer to the error in the ratio or multiplying power of scales with which counterpoise weights are used.

The columns with the heading "Tolerance on beam" refer to those parts of scales not requiring the use of removable weights; for example, a beam.

The column with the heading "Load" refers to the amount of weight on the platform of the scale.

Application of Tolerances to Railroad Track Scales.—In the case of railroad track scales, designed and used for weighing ordinary freight traffic, when the test load consists of a one-truck test car, the largest algebraic mean of any two errors found for different positions of the test truck shall not exceed the tolerance corresponding to the test load used: Provided, however, That no two errors shall be selected, corresponding to positions of the test truck closer together than the distance between extreme positions which the truck can assume on opposite ends of the shortest span. The tolerance given in the table is not to be applied to the error found for a single position of the test load. (The largest algebraic mean of any two errors may be defined as one-half of the largest plus (+) or minus (−) sum that can be obtained by adding any two errors, such as two plus errors, two minus errors, a numerically large plus error and a numerically small minus error, or a numerically large minus error and a numerically small plus error.)

In order that the largest algebraic mean of any two errors, which represents the maximum error of freight car weighing, may not differ appreciably from the true amount, a test car having a wheel base not exceeding 7 feet should be used.

COUNTER BALANCES AND SCALES

Definition.—A counter scale is a scale of any type which is especially adapted on account of its compactness, light weight, moderate capacity, and arrangement of parts, for use upon a counter or table. It is to be noted, however, that those types embraced in the definitions of platform scales, spring scales, and cream-test and butter-fat-test scales are considered under their specific headings.

Specifications.—1. Bearings shall be so shaped that when the beam or levers are displaced in any manner the knife-edges will return to their proper lines of contact. (The term "bearing" as used in this specification is defined as that part of the scale designed to be in contact with the edge of the knife-edge.)

2. All loose material used for adjusting the balance of a scale shall be securely inclosed.

3. All devices for adjusting the balance of a counter scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely separate from the movable mechanism of the scale itself, such as a screw-driver, wrench, etc., but not an adjusting pin.

4. All devices for adjusting the level of a counter scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely separate from the leveling devices, such as a screw-driver, wrench, etc., but not an adjusting pin.

5. Counter scales whose weight indications are changed by an amount greater than one-half the tolerance allowed, when set in any position on a surface making an angle of 5 per cent or approximately 3° with the horizontal, shall be equipped with a device which will indicate when the scale is level, and in no case shall any pendulum operating the scale be considered a leveling device. The scale shall be rebalanced at zero each time its position is altered during this test.

6. In the case of equal-arm scales, either with stabilized pans or plates—that is, those above the beam—or with suspended pans or plates, the minimum fall or drop of the pans or plates from their highest point shall be as follows:

Capacity	*Minimum fall*
	Inch
Four pounds and below	*0. 35*
From 4 pounds, including 12 pounds	*. 5*
From 12 pounds, including 26 pounds	*. 75*
Over 26 pounds	*1. 0*

7. In the case of counter scales having unequal arms or having a compound lever system, and equipped with a graduated beam which is not provided at or near its end with a trig-loop or graduated scale or arc or other suitable reference interval or point for establishing the proper position of balance of the beam, the beam shall have a minimum total angular play of 8 per cent or approx-

imately 5°. In case such scales are provided with a trig-loop or graduated scale or arc or other suitable reference interval or point, the minimum total movement of the beam at such point shall be 0.4 inch if the beam is 12 inches or less in length and 0.5 inch if the beam is over 12 inches in length. (The angular motion of the beam in terms of per cent may be obtained by dividing the total fall or drop of the beam at its end by the distance from the fulcrum to the end of the beam and multiplying this quotient by 100.)

8. Scales of such construction that any weight or weights which are not visible can be added so as to affect the indications of the scale shall be equipped with a device which will plainly indicate on the customers' side of the scale when the weight or weights have been added and the value which it or they represent on the scale.

9. On scales of the equal-arm type with stabilized pans—that is, pans above the beam—the under connections and a line connecting the outer knife-edges in the beam shall form a parallelogram. These under connections shall be straight and work freely.

10. All scales shall be so constructed that when a weight whose body has approximately equal diameter and height and which represents one-half of the capacity of the scale is shifted in any direction on the weight plate or on the commodity plate, pan, or scoop to a point one-half the distance between the center and edge of the weight plate or the commodity plate, pan, or scoop, the additional resulting error in the weight indication, due to this cause alone, shall not exceed the tolerance allowed at the load in question given in the column headed "Tolerance on parts requiring employment of removable weights": Provided, however, That in this test the edge of the weight shall not be made to project over the edge of the weight plate or the commodity plate, pan, or scoop.

10a. The maximum value of the minimum graduations of the graduated beams of counter scales used in the sale of foodstuffs at retail shall be 1 ounce: Provided, however, That this shall not apply to scales used exclusively in the sale of vegetables.

11. In the case of counter scales equipped with an indicator and a reading face or dial, such parts shall conform to all the specifications applicable to them, given under the heading "Spring scales," except that the graduations are not required to be equally spaced.

12. All counter scales shall be in level.

13. When not modified by the above, the specifications given under the heading "Scales: General specifications" shall apply to counter scales in so far as they are applicable.

Sensibility Reciprocal.—The maximum sensibility reciprocal allowable for counter scales shall not exceed the values given in the table below, at the capacity or at any lesser load, with the exception that when the maximum sensibility reciprocal herein given is a larger value than that represented by two of the minimum graduations on any beam with which the scale may be equipped, the latter value shall be applied and used as the maximum sensibility reciprocal, at the capacity or at any lesser load: Provided, however, That the manufacturers' maximum sensibility reciprocals or the maximum sensibility reciprocals on all new counter scales shall be one-half of the values given in the table unless this value is greater than one of the minimum graduations on the beam, in which case this latter value shall be used.

(The term "sensibility reciprocal" means the weight required to move the position of equilibrium of the beam, pan, pointer, or other indicating device of a scale a definite amount. In the case of equal-arm scales and scales with a single pan or plate above, or hanging from, the beam, which are not provided with a pointer moving over a graduated scale or arc, the sensibility reciprocal is the amount of weight required on the pan or plate to cause it to move from its position of equilibrium, when the scale is in balance, to a position of equilibrium at the limit of its motion.)

Capacity	Maximum sensibility reciprocal allowable	Capacity	Maximum sensibility reciprocal allowable
Pounds	Ounces	Pounds	Ounces
1.....	1/8	24.....	1
2.....	1/8	25.....	1
4.....	1/4	30.....	1
5.....	1/4	40.....	1¼
6.....	1/4	50.....	1½
8.....	1/2	60.....	1½
10.....	1/2	75.....	2
12.....	1/2	90.....	2½
15.....	3/4	100.....	3
20.....	3/4		

Tolerances.—Except on the special tests described above, the tolerances to be allowed in excess or deficiency on counter scales shall not be greater than the values shown in the following table: Provided, however, That the manufacturers' tolerances or the

tolerances to be allowed on new counter scales shall not be greater than one-half of the values given: And provided further, That the tolerance on counter scales at any load shall in no case be less than one-half of the sensibility reciprocal of the scale at the load in question; and when the scale has a reading face or dial, the tolerance shall in no case be less than one-fourth of the minimum graduation on the reading face or dial, except that on new scales they shall in no case be less than one-eighth of such minimum graduation.

Load	Tolerance on parts requiring employment of removable weights	Tolerance on beam or reading face	Load	Tolerance on parts requiring employment of removable weights	Tolerance on beam or reading face
Pounds	Ounces	Ounces	Pounds	Ounces	Ounces
1.....	1/16	1/16	40.....	7/16	5/8
2.....	1/16	1/8	50.....	1/2	3/4
4.....	1/8	3/16	60.....	5/8	1
5.....	1/8	3/16	75.....	3/4	1
6.....	1/8	3/16	90.....	7/8	1¼
8.....	1/4	3/8	100.....	1	1½
10.....	1/4	3/8	150.....	1½	2
12.....	1/4	3/8	200.....	2	3
15.....	5/16	1/2	240.....	2½	4
16.....	5/16	1/2	250.....	2½	4
20.....	5/16	1/2	300.....	3	4½
24.....	3/8	1/2	350.....	3½	5
25.....	3/8	1/2	400.....	4	6
30.....	3/8	5/8			

SUSPENSION SCALES OF THE LEVER TYPE

Definition.—Suspension scales of the lever type are lever scales designed and adapted to be hung from or attached to some support above and outside of the structure of the scale itself, and which are not included within other classes herein defined. This class shall include steelyards, butchers' meat beams, suspension abattoir scales, crane scales, overhead tramway scales, suspension creamery scales, suspension pendulum scales, and the like.

Specifications and Tolerances.—Suspension scales of the lever type having a capacity of more than 400 pounds shall be subject to the same specifications, in so far as these are applicable, and the same sensibility reciprocals and tolerances as platform scales.

Suspension scales of the lever type having a capacity of 400 pounds or less shall be subject to the same specifications, in so far as these are applicable, and the same sensibility reciprocals and tolerances as counter scales. In the case of suspension scales of the lever type equipped with an indicator and a reading face or dial, such parts shall conform to all the specifications applicable to them, given under the heading "Spring scales," except that the graduations are not required to be equally spaced.

SPRING SCALES

Definition.—A spring scale is a scale in which the weight indications depend upon the change of shape or of dimensions of an elastic body or system of such bodies: Provided, however, That scales in which metallic bands or strips are employed for the primary purpose of fulfilling the functions of knife-edges and bearings shall not be considered spring scales within the meaning of this definition.

Specifications. 1.—Graduated faces shall be permanently fixed in position.

2. All graduations shall be clear and distinct and equally spaced *and in no case shall their width be less than 0.008 inch.*

3. The clear interval between the graduations shall not be less than 0.04 inch.

4. The maximum value of the graduations on spring scales used in the sale of foodstuffs at retail shall be 1 ounce: Provided, however, That this shall not apply to scales used exclusively in the sale of vegetables.

5. The scale shall have a definite and clear zero graduation and there shall be no stop to prevent the indicator from going beyond the zero graduation. These conditions shall be fulfilled whether the entire face is graduated or the graduations commence at a fixed load.

6. The indicator shall be firmly attached and reach to the graduated divisions.

7. All indicators shall be so designed and constructed that the indications are definite and may be read with precision.

8. The distance between the indicator and the reading face shall not exceed 0.12 inch.

9. All devices for adjusting the balance of a spring scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely

separate from the movable mechanism of the scale itself; such as a screw-driver, wrench, etc., but not an adjusting pin.

10. All devices for adjusting the level of a spring scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely separate from the leveling devices; such as a screw-driver, wrench, etc., but not an adjusting pin.

11. No device to alter the working or effective length of the spring shall be placed on the outside of the scale.

12. Spring scales of the hanging type shall be freely suspended from the ring when in use.

13. If scales are provided with a hanging pan, this shall be suspended from a ring and no hook will be allowed. A hook may be used only on those scales for which no pan is provided.

14. Spring scales shall be so constructed that when a weight whose body has approximately equal diameter and height and which represents one-half of the capacity of the scale, is shifted in any direction on the commodity plate, pan, or scoop to a point one-half the distance between the center and the edge of the plate, pan, or scoop, the additional resulting error in the weight indication, due to this cause alone, shall not exceed the tolerance allowed at the load in question given in the column headed "Added tolerance for shift test at half capacity": Provided, however, That in this test the edge of the weight shall not be made to project over the edge of the commodity plate, pan, or scoop.

15. Spring scales whose weight indications are changed by an amount greater than one-half the tolerance allowed, when set in any position on a surface making an angle of 5 per cent or approximately 3 degrees with the horizontal shall be equipped with a device which will indicate when the scale is level. The scale shall be rebalanced at zero each time its position is altered during this test.

16. Spring scales of such construction that a weight or weights which are not visible can be added so as to affect the indications of the scale, shall be equipped with a device which will clearly indicate on the customers' side of the scale when the weight or weights have been added, and the value which it or they represent on the scale.

17. Spring scales shall give correct weight indications whether the load on the plate, pan, or scoop is being increased or decreased.

18. The specifications for each part of combination spring and lever scales shall be the same as those for the type of scale to which such part belongs.

19. All counter spring scales shall be in level.

20. When not modified by the above, the specifications given under the heading "Scales: General specifications" shall apply to spring scales in so far as they are applicable.

Tolerances.—Except on the special tests described above, the tolerances to be allowed in excess or deficiency on all spring scales equipped with a device intended to compensate for changes in the elasticity of the springs due to temperature effects, shall not be greater than the values given in the tolerance table under the heading "Counter balances and scales."

Except on the special tests described above, the tolerances to be allowed in excess or deficiency on all spring scales not equipped with a device intended to compensate for changes in the elasticity of the springs due to temperature effects, shall not be greater than the values shown in the following table: Provided, however, That the manufacturers' tolerances or the tolerances to be allowed on all new spring scales described herein shall not be greater than one-half of the values given.

However, the tolerances on all spring scales described in the two preceding paragraphs shall in no case be less than one-fourth of the minimum graduation on the reading face or dial, except that on new spring scales they shall in no case be less than one-eighth of such minimum graduation.

Load	Tolerance	Added tolerance for shift test at half capacity	Load	Tolerance	Added tolerance for shift test at half capacity
Pounds	Ounces	Ounces	Pounds	Ounces	Ounces
1.....	1/8	1/16	40.....	2	7/16
2.....	1/4	1/16	50.....	3	1/2
3.....	1/4	1/16	60.....	3	5/8
4.....	1/2	1/8	75.....	4	3/4
5.....	1/2	1/8	90.....	4	7/8
6.....	1/2	1/8	120.....	5	1¼
7.....	1/2	1/4	150.....	6	1½
8.....	3/4	1/4	200.....	8	2
10.....	3/4	1/4	300.....	12	3
12.....	1	1/4		Pounds	
15.....	1	5/16	400.....	1	.....
20.....	1½	5/16	500.....	1¼	.....
24.....	1½	3/8	600.....	1½	.....
25.....	1½	3/8			
30.....	2	3/8			

STRAIGHT-FACE SPRING SCALES

Definition.—A straight-face spring scale is a spring scale in which an indicator or graduated face is affixed to a spring without ntervening mechanism and registers the extension of the spring on a straight graduated face.

Specifications.—1. The support for the spring shall be of sufficient strength and rigidity to sustain the capacity load of the scale without perceptible strain, and such support shall be permanently fixed to the frame of the scale.

2. The graduated face shall be firmly riveted to the frame at not less than three points.

3. The indicator shall be pointed in order to facilitate accurate reading, and it shall not obscure the figures showing the value of the graduations.

4. The value and spacing of the graduations shall satisfy the requirements of the following table:

Capacity	*Maximum value of interval*	*Minimum distance between graduations*
Pounds	*Pounds*	*Inch*
25.....	*1/2*	*0.03*
50.....	*1*	*.03*
100.....	*1*	*.03*
200.....	*2*	*.03*
300.....	*5*	*.04*
400.....	*5*	*.04*
500.....	*5*	*.04*

5. When not modified by the above, the specifications given under the headings "Scales: General specifications" and "Spring scales" shall apply to straight-face spring scales in so far as they are applicable.

Tolerances.—The tolerances to be allowed in excess or deficiency on all straight-face spring scales shall not be greater than four times the values given under the heading "Spring scales," subheading "Tolerances."

COMPUTING SCALES

Definition.—A computing scale is a scale which, in addition to indicating the weight, indicates the total price of the amount of commodity weighed for a series of unit prices.

Specifications.—1. Computing scales shall be correct in both their weight and value indications.

2. Computing scale charts shall not repeat the same values in any given column or row. This applies also to charts on which the value graduations are correctly placed, but which, in addition, have a duplication of value figures in any given column or row.

3. The value graduations on all computing charts shall not exceed 1 cent on all prices per pound up to and including 30 cents. At any higher price per pound the value graduation shall not exceed 2 cents: Provided, however, That nothing in the above shall be construed to prevent the placing of a special value graduation to represent each 5-cent interval. These special graduations may take the form of dots, staggered graduations, or similar forms. They shall be so placed that their meaning and value may be clearly understood, but they shall not be placed in the space between the regular graduations.

4. All computing scales equipped with a drum-shaped chart shall be so constructed that the opening on the dealers' side discloses at least two value graduations at the lowest price per pound. These scales shall be so constructed that the opening on the customers' side discloses the smallest graduations and a figure representing the proper number of main weight units when any load is placed on the pan or platform.

5. All computing scales shall be equipped with weight indicators on both the dealers' and customers' sides, *and their width shall not exceed 0.015 inch.* The distance between the chart and the weight indicators shall in no case exceed 0.06 inch. Both indicators shall reach to the graduated divisions and shall indicate clearly and correctly.

6. All computing scales shall be equipped with a value indicator on the dealers' side, *and its width shall not exceed 0.015 inch.* The distance between the chart and the value indicator shall in no case exceed 0.06 inch. This indicator shall reach to each value graduation and shall indicate clearly and correctly.

7. The weight graduations and the value graduations shall be clear and distinct, but in no case shall their width be less than 0.008 inch.

8. The maximum value of the weight graduations on computing scales used in the sale of foodstuffs at retail shall be 1 ounce.

9. The clear interval between the weight graduation marks on all computing scales shall not be less than 0.04 inch. The clear interval between the value graduation marks on all computing scales shall not

be less than 0.02 inch: Provided, however, That the latter requirement shall not be construed to apply to the special value graduation denoting the 5-cent interval, mentioned heretofore.

10. All devices for adjusting the balance of a computing scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely separate from the movable mechanism of the scale itself, such as a screw-driver, wrench, etc., but not an adjusting pin.

11. All devices for adjusting the level of a computing scale shall be of such construction that they are operative or accessible only by the use of some tool or device which is outside of and entirely separate from the leveling devices, such as a screw-driver, wrench, etc., but not an adjusting pin.

12. Computing scales whose weight indications are changed by an amount greater than one-half the tolerance allowed, when set in any position on a surface making an angle of 5 per cent or approximately 3 degrees with the horizontal, shall be equipped with a device which will indicate when the scale is level, and in no case shall any pendulum operating the scale be considered a leveling device. The scale shall be rebalanced at zero each time its position is altered during this test.

13. Computing scales shall give correct results whether the load is being increased or decreased.

14. All devices intended to increase the capacity of computing scales by the addition of an added weight or weights shall operate properly irrespective of the speed with which they are manipulated.

15. All counter computing scales shall be in level.

16. The specifications on a computing scale and on all parts of a computing scale, when not modified by the above, shall be the same as those of the type to which the scale under test belongs. Also when not modified by the above, the specifications given under the heading "Scales: General Specifications" shall apply to computing scales in so far as they are applicable.

17. When the scale is of such a type that the definition of sensibility reciprocal is applicable, the maximum allowable sensibility reciprocal shall be the same value as is permitted for a noncomputing scale of the appropriate type.

Tolerances.—Except on the special tests described above, the tolerances to be allowed in excess or deficiency on all spring computing scales equipped with a device intended to compensate for changes in the elasticity of the springs due to temperature effects,

and also all those not operated by springs, shall not be greater than the values given in the tolerance table under the heading "Counter balances and scales."

Except on the special tests described above, the tolerances to be allowed in excess or deficiency on all spring computing scales not equipped with a device intended to compensate for changes in the elasticity of the springs due to temperature effects, shall not be greater than the values given in the tolerance table under the heading "Spring scales."

However, the tolerances on all computing scales equipped with a reading face or dial shall in no case be less than one-fourth of the minimum graduation on the reading face or dial, except that on new computing scales they shall in no case be less than one-eighth of such minimum graduation.

CREAM-TEST AND BUTTER-FAT-TEST SCALES

Definition.—A cream-test or butter-fat-test scale is a scale especially designed and adapted for determining the fat content of cream or butter.

Specifications.—*1. All scales shall be provided with a graduated scale or arc divided into at least 10 equal spaces, over which the indicator shall play.*

2. The clear interval between the graduations on the graduated scale or arc shall not be less than 0.04 inch.

3. The indicator shall be of such length as to reach to the graduated divisions and shall terminate in a fine point to enable the readings to be made with precision.

4. All scales whose weight indications are changed by an amount greater than one-half the tolerance allowed, when set in any position on a surface making an angle of 5 per cent or approximately 3 degrees with the horizontal, shall be equipped with leveling screws and with a device which will indicate when the scale is level. The scale shall be rebalanced at zero each time its position is altered during this test.

5. All scales shall be so constructed and adjusted that when the pans are released or disturbed the pointer will return to its original position of equilibrium.

6. When not modified by the above, the specifications given under the heading "Scales: General specifications" (except specification No. 2) shall apply to cream-test and butter-fat-test scales in so far as they are applicable.

Sensibility Reciprocal.—The maximum sensibility reciprocal allowable for these scales shall not exceed 1 grain, or approximately 65 milligrams, when the maximum load is placed upon the scale: Provided, however, That the manufacturers' maximum sensibility reciprocal or the maximum sensibility reciprocal on all new scales shall not be greater than one-half of this value. (The maximum load is defined as the weight of the sample used in each bottle multiplied by the number of bottles for which the scale is designed, plus the total tare of these bottles.)

(The term "sensibility reciprocal" means the weight required to move the position of equilibrium of the beam, pan, pointer, or other indicating device of the scale a definite amount. In the case of scales provided with a single indicator and a graduated scale or arc, one of which oscillates with reference to the other to form a convenient means for determining the position of equilibrium of the beam, and which does not of itself directly indicate in terms of weight, the sensibility reciprocal is the weight required to cause a change in the position of rest of the pointer equal to one division of the graduated scale or arc.)

Tolerances.—The tolerance to be allowed in excess or deficiency on all cream-test and butter-fat-test scales shall not be greater than one grain or approximately 65 milligrams: Provided, however, That the manufacturers' tolerance or the tolerance to be allowed on all new scales shall not be greater than one-half of this value.

These tolerances shall be applied to single loads of 18 grams each, added successively until the maximum load as defined above is placed upon the scale.

PRESCRIPTION SCALES AND BALANCES

Definition.—Prescription scales and balances are scales and balances designed for or adapted to weighing the ingredients of medicinal and other formulas prescribed by physicians and others and entering into the ordinary trade of pharmacists and chemists, and which are used or intended to be used for such purpose.

Specifications.—1. All scales and balances shall be equipped with a device which will accurately indicate the position of equilibrium of the beam. If this device is provided with only one indicating edge, line, or point, then it shall also be provided with a graduated scale or arc. If this device consists of a scale or arc

and a single indicating edge, line, or point, or of two indicating edges, lines, or points, which move in opposite directions, these shall be so designed and constructed that when the beam vibrates one will oscillate with reference to the other.

2. Any graduated scale or arc similar to that referred to in specification 1, shall be divided into equal spaces with at least 0.04 inch clear interval between the graduations.

3. If the indicating device referred to in specification 1, is provided with a single indicating edge, line, or point, this shall reach to the graduated scale or arc and shall be designed and constructed to enable the readings to be made with precision. If provided with two indicating edges, lines, or points, these shall be sharply defined *and shall in no case be more than 0.04 inch from each other when the scale is in balance, this space to be measured horizontally.*

4. The distance between the graduated scale and the indicator shall in no case exceed 0.04 inch.

5. All knife-edges and bearings shall be made of hardened and tempered steel or agate.

6. The graduations on all graduated beams shall be clear and distinct, *and in no case shall their width be less than 0.008 inch.*

7. The clear space between graduations on all graduated beams shall not be less than 0.04 inch.

8. All scales and balances shall be provided with a device for arresting the vibration of the beam.

9. All scales and balances shall be so constructed and adjusted that when the beam is released or disturbed it will return to its original position of equilibrium.

10. All scales and balances whose weight indications are changed by an amount greater than one-half the tolerance allowed, when set in any position on a surface making an angle of 5 per cent or approximately 3 degrees with the horizontal, shall be equipped with a device which will indicate when the scale is level, and in no case shall any pendulum operating the scale be considered a leveling device. The scale shall be rebalanced at zero each time its position is altered during this test.

11. For the purpose of applying the sensibility reciprocal and tolerances the capacity of all prescription scales and balances which are in the State on January 1, 1917, either in use or in the stock of manufacturers of or dealers in such apparatus (class 2)

and which shall not have the nominal or rated capacity marked upon them, shall be taken to be 1 apothecaries' ounce (or 30 grams).

12. When not modified by the above, the specifications given under the heading "Scales: General specifications" shall apply to prescription scales and balances in so far as they are applicable.

Sensibility Reciprocal.—The maximum sensibility reciprocal allowable for prescription scales and balances of a capacity of ½ ounce (or 15 grams) or more shall not exceed 0.2 grain (or 13 mg), at the capacity or at any lesser load, with the exception that when this value is larger than that represented by two of the minimum graduations on any beam with which the scale may be equipped, the latter value shall be applied and used as the maximum sensibility reciprocal, at the capacity or at any lesser load: Provided, however, That the manufacturers' sensibility reciprocal or the maximum sensibility reciprocal on all new prescription scales and balances shall be one-half of the value given unless this value is greater than one of the minimum graduations on the beam, in which case this latter value shall be applied and used as the maximum sensibility reciprocal.

NOTE.—If any prescription scale or balance has a smaller capacity than ½ ounce (or 15 grams), the maximum sensibility reciprocal to be allowed at the capacity or at any lesser load shall be the same proportionate part of 0.2 grain (or 13 mg) that this capacity is of ½ ounce (or 15 grams).

(The term "sensibility reciprocal" means the weight required to move the position of equilibrium of the beam, pan, pointer, or other indicating device of a scale or balance a definite amount. In the case of scales provided with a single indicator and a graduated scale or arc one of which oscillates with reference to the other to form a convenient means for determining the position of equilibrium of the beam, and which does not of itself directly indicate in terms of weight, the sensibility reciprocal is the weight required to cause a change in the position of rest of the pointer equal to one division of the graduated scale or arc.

In the case of scales equipped with two indicators which move in opposite directions and oscillate with reference to each other to form a convenient means for determining the position of equilibrium of the beam, the sensibility reciprocal is the weight required to cause a separation of the indicators of 0.04 inch.)

Tolerances.—The tolerance to be allowed in excess or deficiency on the ratio of arms of prescription scales and balances shall not be greater than the following values:

Load		Tolerance on ratio	
Ounces, ap.	Grams	Grains	Milligrams
8	240	3.2	208
4	120	1.6	104
2	60	.8	52
1	30	.4	26
½	15	.2	13

NOTE.—If any prescription scale or balance has a smaller capacity than ½ ounce (or 15 grams), the tolerance to be allowed shall be the same proportionate part of 0.2 grain (or 13 mg) that this capacity is of ½ ounce (or 15 grams).

If the scale is equipped with a graduated beam, the tolerance at any graduation on the beam shall be equal to the actual sensibility reciprocal of the scale at the load in question.

CLASS B

In the case of a drug store doing prescription work, which is provided with a "Class A" prescription scale or balance—that is, one which meets the requirements noted above—then and in that case only an additional prescription scale or balance meeting the following requirements may also be sealed, but only for the weighing of loads of 10 grains or more. Such scale shall be known as a "Class B" prescription scale or balance and shall not be used for weighing any load of less than 10 grains.

All Class B scales and balances shall be conspicuously and clearly marked with the words "Class B. Not to be used in weighing loads of less than 10 grains," or with a similar and suitable wording conveying the same information.[1]

Such scales and balances shall conform to all the specifications for Class A scales and balances, but will be allowed the following sensibility reciprocals and tolerances:

Sensibility reciprocal.—The maximum sensibility reciprocal allowable for Class B prescription scales and balances shall not exceed 0.5 grain, at the capacity or at any lesser load: Provided, however, That the manufacturers' maximum sensibility reciprocal

[1] In the case of Class B prescription scales and balances, which are manufactured in the State or brought into the State after Jan. 1, 1917 (Class 1), this requirement shall be fulfilled by the manufacturer. In all other cases the inscription shall be placed upon such scales and balances by the sealer.

or the maximum sensibility reciprocal on all new Class B prescription scales and balances shall be one-half of the value given.

Tolerances.—The tolerances to be allowed in excess or deficiency on the ratio of arms of all Class B prescription scales and balances shall not be greater than the following values:

Load		Tolerance on ratio	
Ounces, ap.	Grams	Grains	Milligrams
8	240	8.0	520
4	120	4.0	260
2	60	2.0	130
1	30	1.0	65
½	15	0.5	30

NOTE.—If any Class B prescription scale or balance has a smaller capacity than ½ ounce (or 15 grams), the tolerance to be allowed shall be the same proportionate part of 0.5 grain (or 30 mg) that this capacity is of ½ ounce (or 15 grams).

If a Class B prescription scale or balance is equipped with a graduated beam, the tolerance to be allowed at any graduation on the beam shall be 0.3 grain (or 20 mg), unless this value is less than the actual sensibility reciprocal of the scale at the load in question, in which case this actual sensibility reciprocal shall be used as the tolerance at any graduation on the beam.

VII. WEIGHTS

Specifications.—1. Weights shall be made of steel, iron, brass, or any other metal or alloy of metals not softer than brass: Provided, however, That weights below one-fourth ounce shall not be made of iron or steel, but may be made of aluminum.

2. Weights shall have smooth surfaces, and no weight of more than 1 gram, 1 pennyweight, or 1 scruple shall have sharp points or corners.

3. Weights shall not be covered with a soft or thick coat of paint or varnish.

4. All holes in which foreign material is to be placed for adjusting purposes must be of such form that this material will be permanently and securely held in place. In no case shall this adjusting material project beyond the surface of the weight.

5. Rings on weights shall not be split or removable.

6. All weights shall be clearly marked with their nominal value, *and in addition weights intended for use on multiplying-lever scales*

shall be clearly marked with the value they represent when used upon the scale for which they are intended: Provided, however, That the values of weights of less than 1 gram, 1 pennyweight, or 1 scruple may be designated by dots, lines, figures, definite shape, or other appropriate means.

Tolerances.—The tolerances to be allowed in excess or deficiency on commercial weights shall not be greater than the following values: Provided, however, That the manufacturers' tolerances or the tolerances to be allowed on new commercial weights shall not be greater than one-half of the values given.

Avoirdupois System

Weight	Tolerance, ordinary weights (ratio 1:1)	Tolerance, counterpoise weights for multiplying-lever scales		
		Ratio less than 100:1	Ratio 100:1 and less than 1000:1	Ratio 1000:1 and over
Pounds	Grains	Grains	Grains	Grains
50.....	100.0	60.0	40.0	20.0
25.....	60.0	36.0	24.0	12.0
20.....	60.0	36.0	24.0	12.0
15.....	40.0	24.0	16.0	8.0
10.....	40.0	24.0	16.0	8.0
8.....	30.0	18.0	12.0	6.0
5.....	30.0	18.0	12.0	6.0
4.....	20.0	12.0	8.0	4.0
3.....	20.0	12.0	8.0	4.0
2.....	15.0	9.0	6.0	3.0
1.....	10.0	6.0	4.0	2.0
Ounces				
10.....	10.0	6.0	4.0	2.0
8.....	5.0	3.0	2.0	1.0
5.....	5.0	3.0	2.0	1.0
4.....	5.0	3.0	2.0	1.0
2.....	3.0	1.8	1.2	.6
1.....	2.0	1.2	.8	.4
1/2.....	2.0	1.2	.8	.4
1/4.....	1.0	.6	.4	.2
1/8.....	.5	.3	.2	.1
1/16.....	.5	.3	.2	.1
1/32.....	.5	.3	.2	.1
1/64.....	.2	.12	.08	.04

The tolerances to be allowed in excess or deficiency on apothecaries' prescription weights shall not be greater than the following values: Provided, however, That the manufacturers' tolerances or the tolerances to be allowed on new apothecaries' prescription weights shall not be greater than one-half of the values given:

Apothecaries' System

Weight	Tolerance	Weight	Tolerance
Ounces, ap.	Grains	Scruples	Grains
12	4.0	3	0.3
10	4.0	2	.25
8	3.0	1	.15
5	3.0	Grains	
4	2.0	20	.15
3	2.0	10	.12
2	2.0	5	.08
1	1.0	2	.04
Drams		1	.03
8	1.0	.5	.02
6	1.0	.2	.015
4	.7	.1	.01
3	.6		
2	.5		
1	.3		
.5	.2		

Metric System.

Weight	Tolerance	Weight	Tolerance
Grams	Milligrams	Milligrams	Milligrams
500	350	500	7
200	200	200	4
100	150	100	3
50	100	50	2
20	50	20	1
10	40	10	1
5	25		
2	15		
1	10		

VIII. METRIC SYSTEM

No specifications contained in the preceding pages shall be understood or construed to prohibit the sale or use of weights and measures or weighing or measuring devices constructed or graduated in units of the metric system.

The tolerances to be allowed on any weight or measure or weighing or measuring device constructed or graduated in units of the metric system, shall be the same as those specified on similar apparatus of an equivalent size or at an equivalent load in the customary system.

APPENDIX 2

LIQUID-MEASURING PUMPS

By F. J. SCHLINK

Assistant Physicist, Bureau of Standards

(The paper constituting this appendix has been issued also as Bureau of Standards Technologic Paper No. 81. For discussion of this paper, see page 57 et seq. of the Conference Report.)

LIQUID-MEASURING PUMPS[1]

By F. J. Schlink

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INTRODUCTION

The present importance of the liquid-measuring pump is largely due to the great extent and amount of the sale of gasoline as a motor fuel. Although measuring pumps are used in other lines, notably in the grocery and wholesale drug trades, it is nevertheless a fact that by far the greatest number are used in the sale of gasoline to motorists; it appears that a very high proportion of gasoline sold in public places for this use is sold through measuring pumps.

The rising price of gasoline and the small margin of profit to the retailer, often amounting to but 1 or 2 cents on the gallon, call for accurate measurement, and make the question of the design and testing of measuring pumps an important one.

The writer is informed that there are more than 7000 measuring pumps in use in Greater New York alone. Approximately 39 firms are engaged in the manufacture of measuring pumps and systems.

[1] Read at the Eleventh Annual Conference on the Weights and Measures of the United States on May 23, 1916.

The wide adoption of measuring pumps has been due to a number of reasons, and the advantages here mentioned must be carefully considered in the drafting of specifications and regulations for their governance. First may be mentioned convenience, since the measing pump provides, through the hose which is commonly attached, a means for delivering gasoline directly into the supply tank of an automobile expeditiously, without spilling and soiling the car or the premises, and with a minimum of waste and evaporation.

The second and most important factor is that of safety. The highly volatile and inflammable nature of gasoline makes its handling in open cans or measures undesirable; the fire risk involves not merely the premises of the merchant but also the automobile, property, and person of the purchaser as well. Gasoline fires are particularly dangerous, on account of the quickness with which they spread and the difficulty of their extinguishment. So important is the fire hazard in the dispensing of gasoline that several associations of insurance underwriters have framed special regulations concerning the handling and storage of gasoline in public garages and filling stations, while the need for protection of communities against these same hazards has caused the enactment of many city ordinances similarly restricting this business.

With regard to the restrictions imposed on the construction of measuring pumps by the insurance underwriters, the Bureau has been unable to collect any great amount of information on account of the limited time available, but it appears that the principal underwriters' associations have not attempted to codify their results, it being their present custom to consider each type of pump individually. This method results in considerable delay and expense to the manufacturer. The Bureau plans to take up this question with the various associations of underwriters, and it is possible that a code of specifications can be worked out which will give due consideration to the requirements of proper administration of weights and measures, as well as that of fire prevention. Naturally, the underwriters have been chiefly concerned with the reduction of the fire risk, and in their work may have sometimes neglected the demands imposed by weights and measures considerations. It is our hope to find a satisfactory basis upon which these two important considerations can be jointly grounded.

A measuring pump may be defined as a pump, or a combination of a pump with other mechanism, adapted for the measurement of fluids in definite quantities by volume.

In many instances the pump itself forms the volumetric measuring device, discharging a definite quantity for each stroke or cycle, and in other types of apparatus the pump is only auxiliary, operating to fill or empty a suitable measuring chamber in which

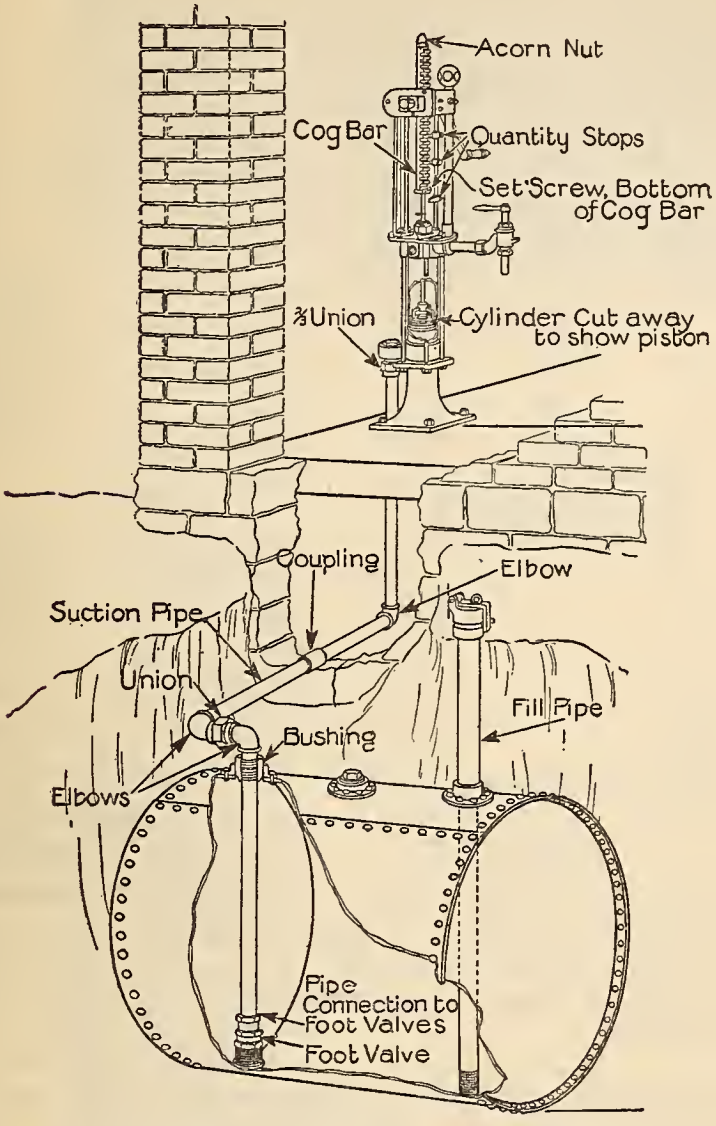

FIG. 4.—*Typical piston-type measuring pump installation, showing arrangement of tank, piping, valves, etc.*

the actual apportionment of the fluid takes place. In this paper endeavor will be made to outline the principal points of interest and value to the inspector of weights and measures relative to the design, construction, inspection, testing, and supervision of measuring pumps coming within his jurisdiction.

PISTON-TYPE MEASURING PUMPS

The ordinary piston pump, familiar to all in numerous industrial applications, possesses the measuring property if means are provided for defining the length of stroke and applying auxiliary mechanism which will insure that each stroke of the piston will discharge a volume of liquid equal to the space volume generated by the piston in its travel. This requires that valves be tight and the piston close-fitting, so as to prevent the return of the liquid to the supply tank or cistern, as well as leakage or slippage of liquid past the piston during its stroke. Other requisites will appear in the later portions of this discussion.

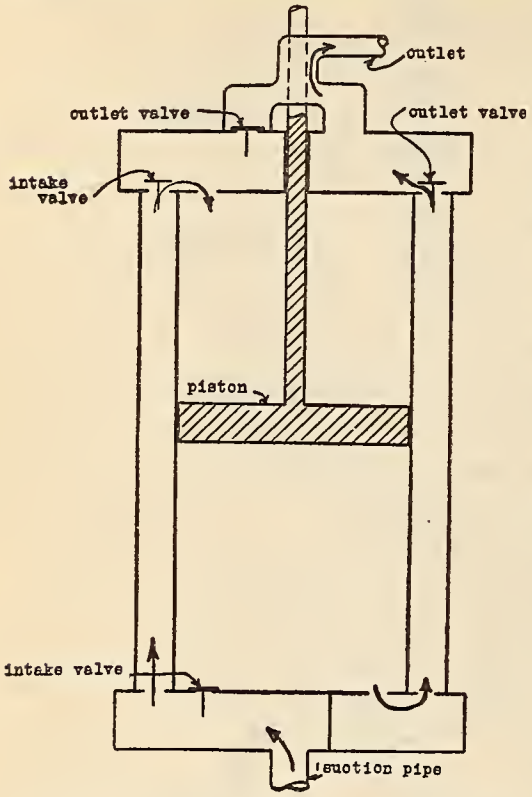

FIG. 5.—*Diagram of double-acting pump, showing arrangement of valves. This type discharges on both up and down strokes. When valves are in position shown, the piston is descending*

Piston pumps may be either single-acting or double-acting; that is, they may discharge liquid either on the upstroke only or they may discharge on both the up and down strokes. As a matter of fact, single-acting piston pumps do discharge on the return stroke, but the amount of this discharge is small and in amount equal to the volume of the piston rod. Occasionally two single-acting pumps are used in combination, discharging on alternate strokes. The differences between the single and double-acting pumps are of construction only; the principles on which they work are too well known to need elaboration here. The points to be considered in their test are the same for each and will be taken up in detail later.

In addition to the ordinary, or "reciprocating-piston" pumps, rotating-piston pumps are used. Those used for measuring purposes are nearly all of one type of construction, which is illustrated in Fig. 7. These pumps are used principally for measurement

FIG. 1.—*Example of large filling station, having 10 measuring pumps for gasoline and 4 for lubricating oil*

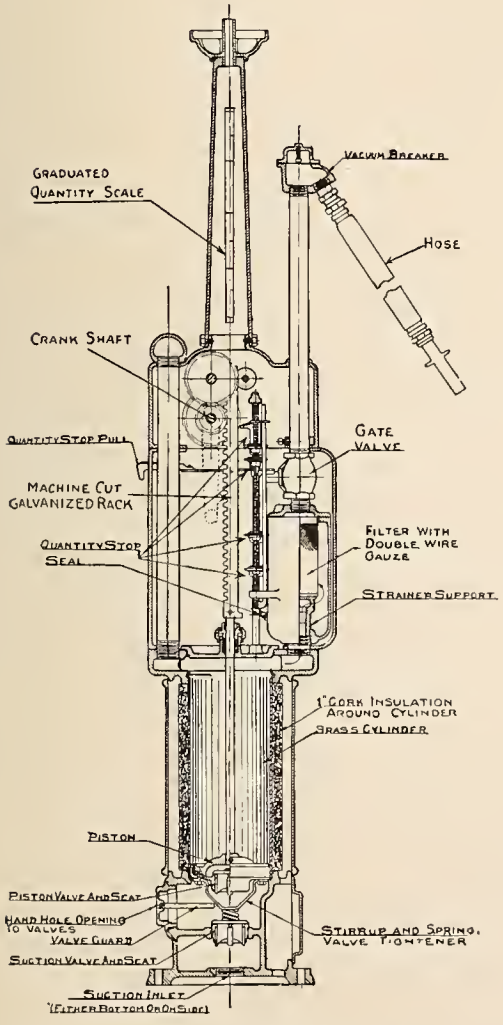

FIG. 2.—*Sectional elevation of typical piston-type measuring pump*

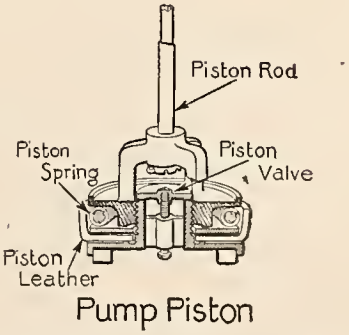

FIG. 3.—*Section of piston, showing cup-leather, expander-spring, and lift valve*

of molasses, tar, and similar viscous liquids; however, some are in use for the dispensing of kerosene, gasoline, and similar mobile liquids. Obviously, when such pumps are employed for measuring purposes, the fit of the operating parts must be very accurate, and especially is this true in the case of the less viscous liquids, since more opportunities for leakage are present in this type of pump on account of the presence of a greater number of submerged impelling parts. Another factor of importance is that in this type of pump it is not feasible to use a flexible packing or piston material, which has the property of yielding and conforming closely to the enveloping surface; on this account, since the relative motion occurs between metallic surfaces, great care is required in obtaining smooth surfaces and nicely fitting parts.

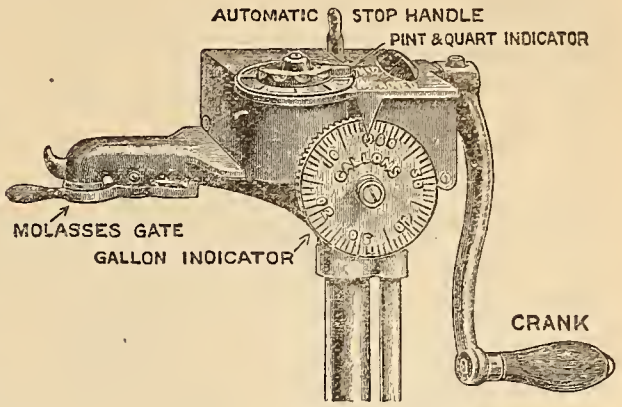

FIG. 6.—*Rotary measuring pump, commonly used for molasses, tar, and other viscous liquid*

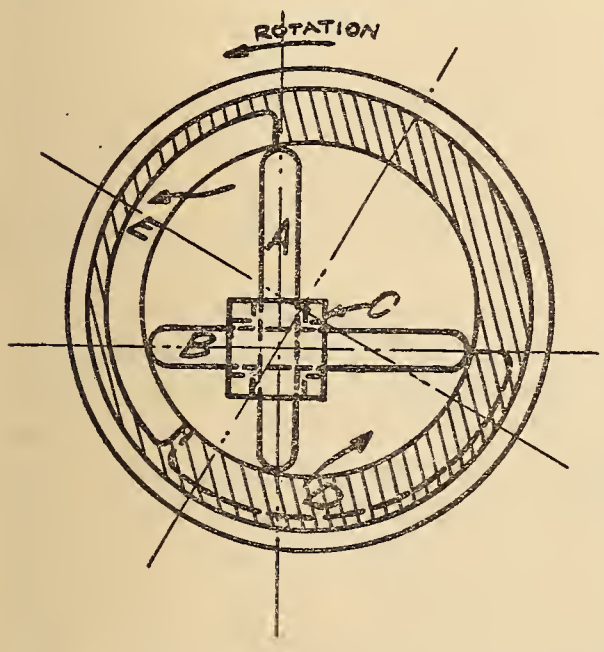

FIG. 7.—*Diagram showing operation of rotary measuring pump of Fig. 6. The bars A and B slide in the central shaft C. As the shaft rotates, the sliders take in the liquid at D and force it out through the port E*

This type of pump is often made so as to be driven by hand or other power, and one form is operated as a motor by the passage through it of the liquid being measured, under suitable pressure. In the latter case it becomes a true "liquid meter" and not a measuring pump. In one case the effect of slippage will tend to make the instrument register more than the true amount passing, and in the other case less than this amount.

A modification of this type is made which comprises an auxiliary device arranged to shut off the flow of liquid after a certain predetermined quantity has passed, thus making it possible to discharge automatically into a container any desired quantity of liquid; after such discharge the flow will cease, the amount passing having in the same operation been registered upon a suitable counter.

COUNTERS

Most measuring pumps of the mechanical type are equipped with a counter or tally, sometimes incorrectly termed a "meter," the function of which is to count and indicate the number of full strokes, which have been completed. These counters are essential appurtenances, since without their use disputes may readily arise between the purchaser and the seller as to the number of units which have been discharged. Obviously, in cases of this kind both parties may believe their count to be the correct one, and a satisfactory adjustment may be reached only after much unpleasantness.

The following are the principal ends to be sought in the design of these tallying devices:

(*a*) Maximum visibility and readibility to both operator and purchaser.

(*b*) Tallying only very near to the end of the stroke. This is important in order to increase the difficulty of and the temptation to "short-stroking."

(*c*) Accurate pointing of the hand to the correct figure. Constructions which will permit the hand to stop at a position intermediate to two figures are to be avoided.

One of the most common types of counters used is, in the writer's opinion, unsuitable, its indications being visible on the edge or periphery of a relatively thick disk; such counters are usually so placed that their indications are readable only from the position of the operator of the pump. Counters should have a dial reading on a plane face, facing the purchaser; if the pump is accessible for filling motor tanks from either front or back, a dial should be provided at both of these aspects.

METERING SYSTEMS

The next type of pump to be taken up is one in which the pump acts merely to discharge the liquid through a meter. One type utilizes the lower specific gravity of gasoline to maintain its

separation from a quantity of water upon which it floats, the water acting as a sort of liquid piston, so that by forcing additional water into the containing tank, as from a city water supply system, the gasoline is displaced in like quantity and delivered through suitable piping to a convenient outlet. Fig. 8 shows the operation of the so-called hydraulic system.

The application of the so-called hydraulic system at once raises the question: Is there any appreciable intersolution of the two liquids; that is, does the water dissolve into the gasoline and the gasoline dissolve into the water? In the first case the result would be a *dilution* of the commodity, and in the second case a *loss* of the commodity into the sewer into which the water contents of the system are finally drained. Unfortunately, we have been unable to give this question the detailed study and experiment which it deserves, but the data available seem to indicate that the gasoline received from the refinery is a saturated solution of water; that is, it contains all the water which it will carry at the temperature of the last process, since, after being treated with sulphuric acid in the refining process the gasoline is thoroughly washed with water to remove as far as possible all traces of acid. During this process the gasoline undoubtedly becomes saturated with water (the term is used in the technical sense). Later, as the temperature changes, the gasoline will change its water content, so as to come, if conditions permit, into a solution equilibrium which tends to obtain at a particular temperature. It is this fact which counts for the frequently noted presence of water in gasoline which at the time of purchase was patently free from water. In view of the facts just adduced, it is thought that solution of water into the gasoline is a factor which may be safely neglected. With regard to solution in the other direction, it may be said that for gasoline of very high grade, which is the only one upon which any data have been obtained, the water might take up 0.2 per cent by weight of gasoline at a temperature of 22° C. With the modern gasolines, which, with the exception of the casing head and blended products, are of much heavier frac-

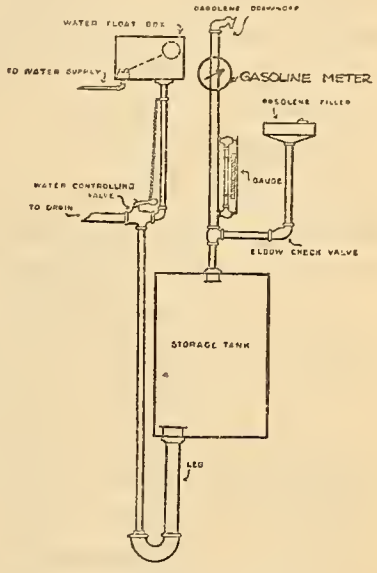

FIG. 8.—*Hydraulic system of storage and metering*

tions than the gasoline just mentioned, facts seem to indicate that the amount of solution of gasoline into the water is very small and probably entirely negligible, especially in view of the fact that conditions in the storage tank are not such as to favor rapid diffusion; to prevent this diffusion as far as possible, baffle plates or their equivalent should be provided to prevent agitation of the mass when either water or gasoline are added to the displacement tank.

In the pneumatic system the pressure of air or an inert gas is applied to the surface of the liquid in a tank, the liquid being forced into the piping system ready to discharge through a meter at the opening of a valve. Another type uses a piston pump of such design as to eliminate pulsations as perfectly as possible; this pump drives the liquid through a meter, measurement being performed by the meter in the same manner as in the hydraulic and pneumatic systems. The mechanical simplicity of the hydraulic, pneumatic, and other meter systems are in their favor, as are the steadiness and continuity of flow, and the rapidity with which the liquid may be handled.

It would seem that the size of the meter dials should be considerably enlarged over that which is now commonly found in service, and the fineness of graduation be increased, perhaps to 0.02 gallon. This is necessary in order to make its readings equivalent in nicety to those of other types of commercial liquid-measuring apparatus. In other types of pumps, under proper conditions, the discharge may be determined and repeated within less than 1 cubic inch; this would require the hydraulic-system meter to be readable by estimation to less than 0.005 gallon.

The accuracy in measurement of these metering systems in the forms just illustrated depends upon the precision and reliability of the operation of the meter and the accuracy with which it may be read. A meter for this purpose must be made with extreme care and carefully maintained. The writer's experience shows that in many installations it is found necessary to clean these meters at frequent intervals; this on account of the very small clearances permissible, and the apparent impossibility of clarifying gasoline commercially so perfectly that no solid or sedimentary particles are carried into the discharge stream.

It should be noted here, that in order to obtain the best precision and reproducibility of reading from a water or gasoline meter, a constant rate of flow should be maintained; in some systems this is provided for by arranging for the discharge of liquid

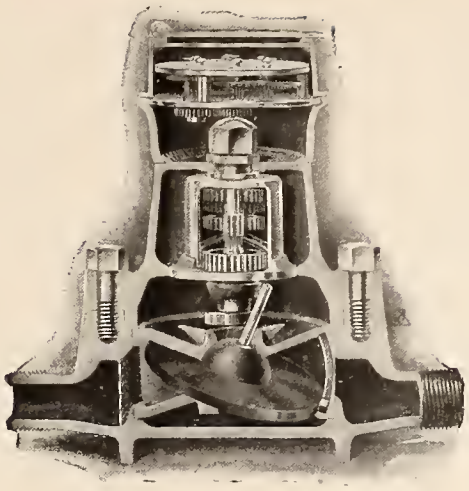

FIG. 9.—*Type of nutating-piston meter, commonly used in connection with the hydraulic and other metering systems*

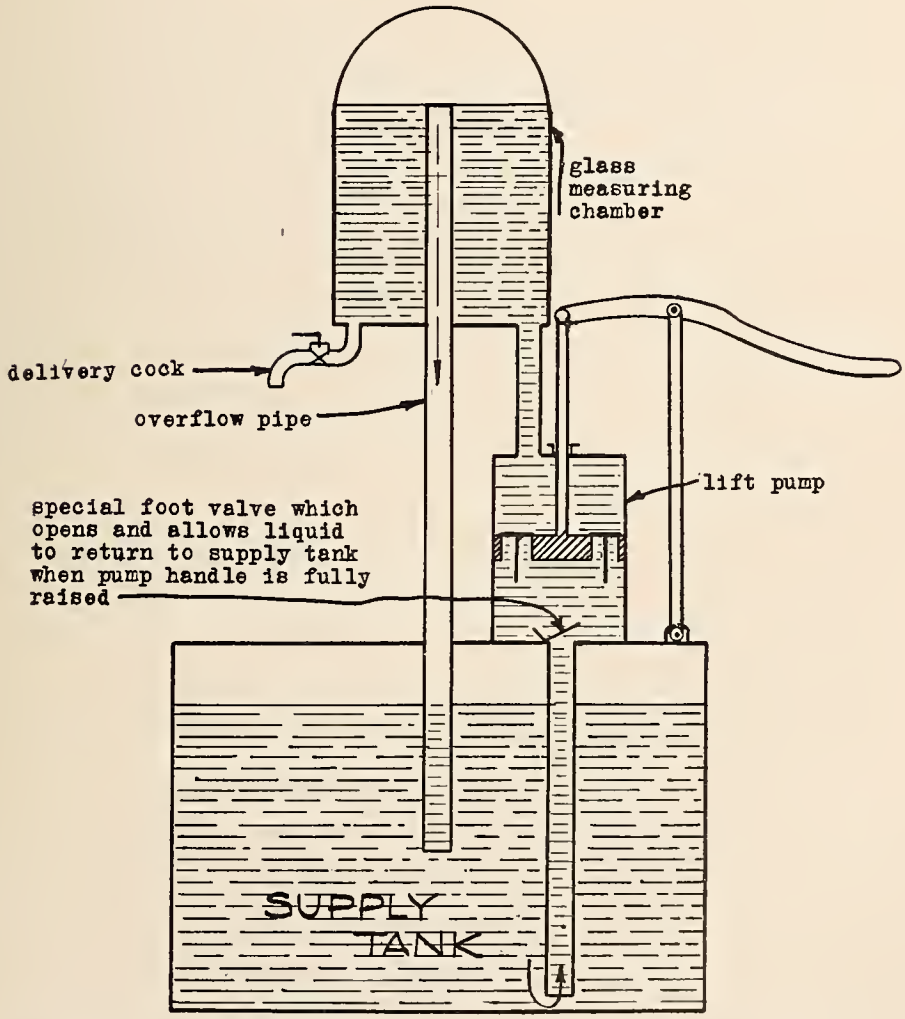

FIG. 10.—*Visible measurement system, discharging excess through overflow pipe in center*

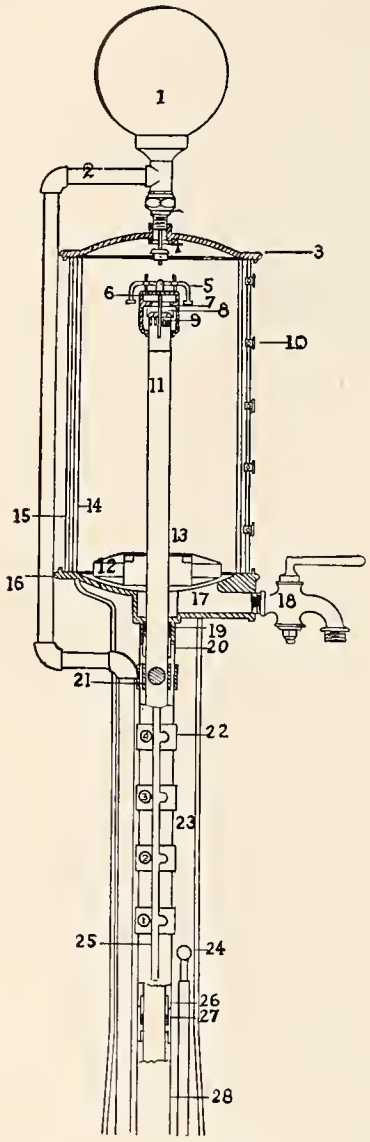

FIG. 11.—*Overflow type, pumping by vacuum. The liquid is forced into the measuring chamber 14 from a convenient supply tank by exhaustion of the air in the chamber. The float 12 rises and shuts off the valve 7. Admission of air through a two-way cock (not shown) allows the liquid in the chamber to drain back to the level of the valve seat. The central tube is adjustable to various heights by engagement with stops, allowing for various units of delivery up to the capacity of the chamber*

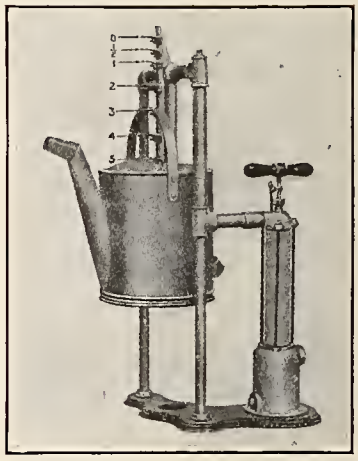

FIG. 12.—*In this type the excess of liquid is abstracted by siphoning back through pump, on opening of the foot valve in the pump base. The different deliveries are obtained by hanging measure on lugs at various heights, indicated by numbers 0, ½, 1, etc.*

under constant head, so maintaining an approximately uniform rate of flow through the meter. For the same reason it is suggested that any valve or cock used in the discharge line for shutting off the stream at the completion of the delivery be of a self-closing type, which can only be maintained at either full or zero opening. This will effectually prevent incorrect registration of the meter due to intentional or inadvertent throttling of the flow.

DEFINITE VOLUME MEASURING-CHAMBER SYSTEMS

A number of measuring-pump systems are founded upon the principle of overfilling a liquid-measuring chamber by adding liquid until an excess is present over the nominal delivery of the apparatus, and then by one of a number of simple expedients, removing the excess, then discharging the adjusted quantity remaining, through a cock or hose in the usual manner. Such pumps are usually made with a glass measuring chamber, in order that the operation of the apparatus and the condition of the liquid may be observed, and that fractional portions may be estimated, or price computation be facilitated.

The initial delivery of the total volume of fluid may be made by any one of a number of means; those commonly employed are the production of a vacuum in the chamber so that the liquid will be forced by atmospheric pressure from the supply tank; forcing of the liquid by application of pressure in excess of atmospheric to the interior of the supply tank; and mechanical pumping. The abstraction of the excess over the nominal delivery can be performed by the same methods.

These details can be better understood by reference to concrete examples shown in the illustrations herewith.

It is suggested that in the types of pumps just described the whole measuring chamber should be clearly visible, so that the presence of sediment or other foreign material, which will act to reduce the initially adjusted volume, can be readily detected and corrected.

GAUGE-GLASS SYSTEMS

Another simple method of liquid measurement is similar to the foregoing, with the exception of the excess abstraction feature just described.

A tall slender tank is provided, either carrying a transparent gauge glass, or itself made of glass. Beside or mounted upon the gauge glass is a graduated scale reading directly in units of volume.

In some cases, instead of a gauge glass a float arrangement is used, the float inside the cylinder being connected by a rod or wire to an indicator outside. This device obviates the danger of breakage which is present when gauge glasses are used, and if properly constructed, will serve the purpose well.

The graduated scale may be securely and permanently affixed, in which case the initial level of the liquid must be adjusted to the zero of the scale, as by discharge at a definite level through an overflow pipe; or it may be slidably mounted, in which case its zero is adjusted into coincidence with the level at which the liquid stands before each delivery is begun. The amount discharged upon the opening of a valve is read by the fall of the liquid column.

It should be noted that in the first case, with the scale permanently fastened, the tank need not be of uniform cross section, since the scale can be calibrated to give correct indications for any given tank, while in the second case, with the slidably mounted scale, the tank must be of uniform cross-sectional area, since the value of a scale interval must be the same for any position of the zero point.

It will be necessary to restrict the permissible diameter of tanks employed in this and similar constructions in order to limit the volume equivalent of a unit length of scale interval. The writer has found a number of such tanks in use in which the diameter was so large that small differences in delivery were quite unreadable. In one installation the tanks were approximately 30 inches in diameter, the graduation corresponding to 1 gallon being but 0.33 inch. Such a high value of volume equivalent per unit of length of graduation interval will be excluded by specification limiting the maximum cross-sectional area of the tank.

WHEELED TANKS

The wheeled tank is coming into wider and wider use, and there are many applications in which it has decided advantages. It is easier and more expeditious to maneuver a portable tank into position for filling a motor car than it is to place an automobile into correct position for filling from a stationary pump. This is especially true of crowded locations, where the maneuvering of automobiles is always accompanied by the danger of striking other cars and stationary objects. There are certain other advantages possessed by the wheeled tank, principal among which is the fact

FIG. 13.—*Gauge-glass type. The rotary pump shown (nonmeasuring) supplies liquid to the tank to any desired level on the graduated scale. Delivery is completed by opening of the discharge cock*

that its construction favors accuracy of delivery. In the wheeled tank the pump is carried partly submerged in the liquid, and the tendency toward foaming or vapor formation is very greatly diminished; in addition, the tendency toward leaking back is reduced, and the pump can be expected to deliver its first gallon

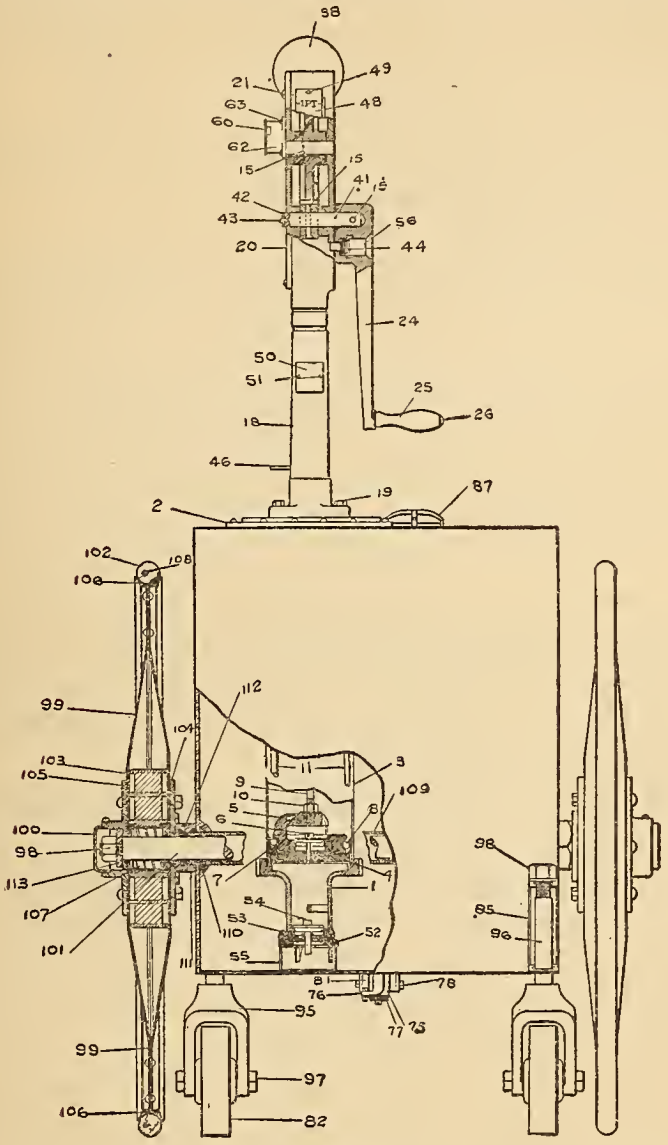

FIG. 14.—*Section of typical wheeled, or portable, measuring pump, showing partial submergence of cylinder parts in the liquid*

after an interval of disuse with much greater accuracy than one connected to a long suction pipe which may require to be partly refilled before discharge at the hose outlet can begin. Wheeled tanks should be provided with splash plates to reduce the liberation of vapor from the contained liquid.

INSPECTION AND TESTING

PIPING AND VALVES

A primary requisite for accurate measurement is freedom from leaks. A piston pump may be readily tested for the presence of leaks in the piston and on the discharge side by tightly closing the outlet valve and performing a number of short strokes until a strong resistance is felt to the motion of the handle. This stored-up pressure the pump should retain for some time, and if appreciable leaks are present in the piston and on the discharge side, they will be noticeable under this test.

However, the presence of leaks in the suction line is still more likely to be fatal to the accuracy of the pump discharge, for several reasons: First, gradual return drainage of liquid stored in the suction line to the tank, on account of leakage of the foot valves or of the suction piping; and, second, the admission of air through leaky suction piping during the continuance of the vacuum which is created on the suction stroke. This admitted air mixes with the liquid, and the pump measurement will comprise a mixture of liquid, air, and vapor. Under such conditions accurate measurement is impossible, and if the pump is adjusted to give an approximate accuracy at a given time with these conditions obtaining, the slightest change in temperature, quality of gasoline, size and number of leaks, speed of operation, and action of operating parts will result in gross inaccuracy of delivery.

Excessive constriction of either the suction or the discharge line may result in faulty measurement. With regard to the suction line, the resulting resistance is a kinetic one operating to increase the virtual suction lift, but in regard to the discharge line it should be noted that partial closing of the discharge valve or the presence of obstructions in the discharge piping may act so as to interpose an abnormal resistance to the liquid stream and on account of the effects of slippage may produce large errors in deficiency. The flow of liquid from the nozzle should be a full, smooth stream. Constricted passages and obstructions near the nozzle are evidenced by a characteristic appearance of eddying and agitation of the discharge stream.

Every effort, then, should be made to install the piping of measuring pump systems with the utmost care, and garage and filling-station owners should be directed to follow with scrupulous exactness the full and explicit directions which most makers furnish as a guide in the installation and operation of their systems.

It would not serve any useful purpose to quote here these instructions, since they can be obtained from measuring pump manufacturers upon request. The inspector of weights and measures can do a real service by giving this advice and supervision in the installation of measuring pump systems, as garage and filling-station owners often disregard the instructions furnished by the makers of the pumps, and so make gross errors in installing their outfits.

HOSE CONNECTIONS

A question which must be carefully considered in the matter of insuring correct delivery from liquid-measuring pumps is the hose which is commonly used in the filling of automobile gasoline tanks. Even the shortest and smallest diameter hose in use hold an appreciable quantity of gasoline; within the writer's knowledge, the smallest diameter of hose in use on gasoline-measuring pumps is about of 0.75 inch internal diameter. A tube 10 feet long of this diameter will contain 53 cubic inches, or nearly 1 quart. There are many gasoline hose in use of 1¼ inches or more internal diameter; such a hose, 1¼ inches in diameter and 10 feet long, will contain 147 cubic inches.

The presence of the hose in the delivery system of the pump introduces an important element of variation in the quantity delivered to the individual purchaser; if the point at which the hose is connected to the pump piping is at a properly chosen height above the highest level at which gasoline will be normally delivered into the gasoline tank of an automobile, the hose will in all parts slope downward, and no liquid will be trapped in it, the whole contents being rapidly drained toward the exit end. If, however, the point of connection of the hose to the pump is low in relation to the point at which the gasoline is discharged to the gasoline tank, a considerable portion of the hose may loop downward below the level of the discharge, and a quantity of gasoline will be retained when the hose is finally hung back into place on the pump, unless the purchaser takes care to lift the low-hanging portions of the hose so as to drain the contents as completely as possible into his tank. It may be said in passing that this expedient is being more and more widely adopted, with the present rise in the price of gasoline. The effect of retrograde sloping portions of the hose in causing short delivery to individual purchasers is one that calls for a remedy, and it is recommended that where hose or flexible tubing is employed in the discharge end of the delivery system, the inner end of the hose be of such height in relation to the length

and stiffness of the hose that all portions of the hose slant downward toward the exit end, in the delivery of gasoline to the high est motor-car fuel tank found in common use.

The writer seriously questions the advisability of the use of a shut-off cock at the end of the delivery hose. The makers and users of pumps frequently maintain that such a cock is necessary to prevent overflowing of the gasoline about the motor car in case more fuel has been asked for than the tank will contain. Observation seems to indicate that the occasions when such overflow would occur are very infrequent and can be entirely eliminated by care and attention on the part of the operator, and that in many cases the presence of a cock at the end of the hose acts so as to facilitate the retention in the hose itself of a portion of the fuel purchased. While this involves no gain to the owner of the pump, it does often involve short measure to the individual purchaser, who often may not obtain the quantity of gasoline in the hose, to which quantity he is fully entitled, unless proper deduction is made from the reading of the pump by measuring it back into a measure. It will surely be admitted that this amount retained will not ordinarily be deducted in reckoning the purchase, and it is therefore urged that this use of a cock at the hose outlet be done away with; it has already been dispensed with by a number of makers. The cock at the pump end of the hose may properly remain to prevent evaporation or accident by loss of liquid from the pump contents.

While measuring pumps will frequently be found in operation under conditions which predicate perfect tightness of valves, it is the opinion of the writer that the valves of a gasoline pump may not usually be relied upon as being sufficiently tight to assure a correct first delivery after the pump has stood unused for a number of hours, as, for example, overnight. Probably when the pumps leave the factory the valves will be tight enough to hold gasoline for long periods. It seems certain, however, when one considers the wear the valves are subjected to in service and the presence of particles of grit and solid matter present in the gasoline, and coming into the gasoline from the interior walls of the piping and the tanks, that perfect or even sensible tightness of check and foot valves is impossible of attainment in practice. This being the case, a proper use of defined-stroke piston type measuring pumps would require that their delivery be not relied upon as accurate after the pump has stood unused for a considerable length of time until at least one correct discharge has been

FIG. 15.—*Excessively long hose due to pump being set back from curb. The procticol impossibility of draining such hose into the purchoser's tonk is obvious*

FIG. 16.—*Showing hose connection at curb level, moking it impossible to secure complete or uniform drainoge in service*

FIG. 17.—*Delivery hose outside, pumps inside. Bod proctice unless purchoser con cleorly observe the operotion of the pump from his position outside*

delivered. Another cause of short delivery on the first discharge, which will be taken up in detail under the next heading, is the formation of gasoline vapor under the piston, due to the reduced pressure to which the gasoline is subjected on account of the height of the liquid column above its free surface. The importance of these conditions, and the fact of their existence, may be easily demonstrated by simple tests. It is therefore strongly recommended that users of gasoline pumps—and the same applies to pumps used for heavier hydrocarbons in a lesser degree—be urged to discharge the first cylinderful, after the pump has so stood for a considerable period, into a can or other receptacle, thence to be returned to the storage tank as opportunity may afford.

HEIGHT OF SUCTION LIFT

Attention is here directed to a matter to which neither manufacturers nor users of gasoline pumps appear to have devoted sufficient attention; this is the question of the permissible maximum suction lift. A volatile liquid like gasoline can not be lifted on the suction side of a pump to a height nearly as great as water can be lifted under similar conditions. This is on account of the fact that the vapor tension of the liquid on comparatively small lifts becomes greater than the reduced pressure above the liquid column and boiling-off of a portion of the material as well as liberation of a portion of the dissolved air take place. Gasoline is a mixture of a number of petroleum fractions which have different boiling points and if the boiling point of the lowest boiling of these several fractions is reached by reduction of pressure, that constituent will start to vaporize rapidly with the effect of filling the space under the piston to a greater or less extent with the vapor of that fraction, and the pump, instead of delivering gasoline alone, will deliver a mixture of gasoline, liquid and vapor.

Various manufacturers in their literature advise the limiting of the suction lift to a height of from 10 to 12 feet, but from a few simple experiments performed at the Bureau of Standards this value seems altogether too high, and it appears that a lift greater than 7 feet may be excessive for some of the ordinary commercial grades of gasoline.

For grades of gasoline containing a considerable proportion of light fractions, such as casing-head gasoline, the suction head allowable becomes practically zero. In cases where these very volatile sorts of gasoline are to be lifted with a piston pump, the

usual installation must be modified. Fig. 18 shows a form of installation in which the suction head is reduced nearly to zero, the vertical lift being all obtained on the discharge side. Under such an arrangement the error due to vaporization practically disappears.

Fig. 19 points out the importance of having a continuous slope in one direction from the pump to the supply tank. If there are traps or points of reversing slope in the pipe line, any vapor formed will tend to become lodged at these points and cause irregular and incorrect measurement due to the entrainment of these "vesicles" of vapor.

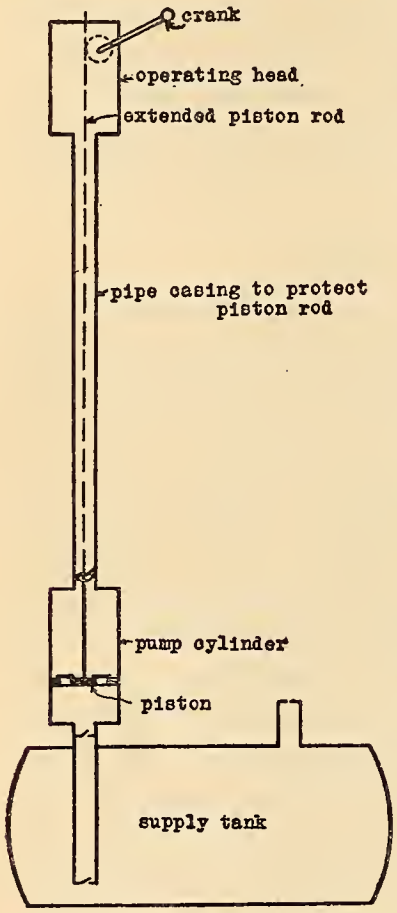

FIG. 18.—*Arrangement of the measuring cylinder at or near the level of the supply tank, employed when the vertical lift is necessarily great, or the liquid to be measured very volatile*

EFFECT OF INERTIA OF THE LIQUID COLUMN

A source of error, the magnitude of which the writer has not yet had opportunity to determine, is the inertia of the moving liquid column. In the usual piston pump, during the delivery stroke, all valves are open in one direction to permit the free passage of the stream. Now, if the stroke be suddenly completed by the contact of the piston rod against a rigid stop, the tendency of the liquid column will be to continue in motion until the energy of its motion is absorbed by the friction of piping, valves, and fittings, and the elevation of the mass against the force of gravity. The energy of this stream is proportional to the product of its mass times the square of its velocity; the inertia error, therefore, can be made a minimum by decreasing the velocity of flow at the expense of the mass of the moving liquid, or practically, by increasing the diameter of the piping.

Pumps having a high rate of delivery may to advantage be equipped with a device which will close a valve in the suction line at the instant the delivery stroke is completed. The only effect of inertia then will be to cause a slight and probably negligible "water hammer."

DEFICIENT DELIVERY DUE TO INCOMPLETE STROKES

Most measuring pumps of the piston type can be made to deliver in deficiency by "short-stroking"—that is, by failing to bring the piston to the limit determined by its stops, at either or both ends of the stroke. This is analogous to incomplete filling or incomplete emptying of a can or measure, and under present conditions must be guarded against by vigilance on the part of the purchaser.

It should be pointed out at this time that it is a matter of no great difficulty to design measuring pumps which can not be fraudulently operated through strokes shorter than the normal. One of the simplest means is the use of the familiar crank and connecting rod mechanism, with the addition of a ratchet to prevent reversal of rotation before the completion of the delivery

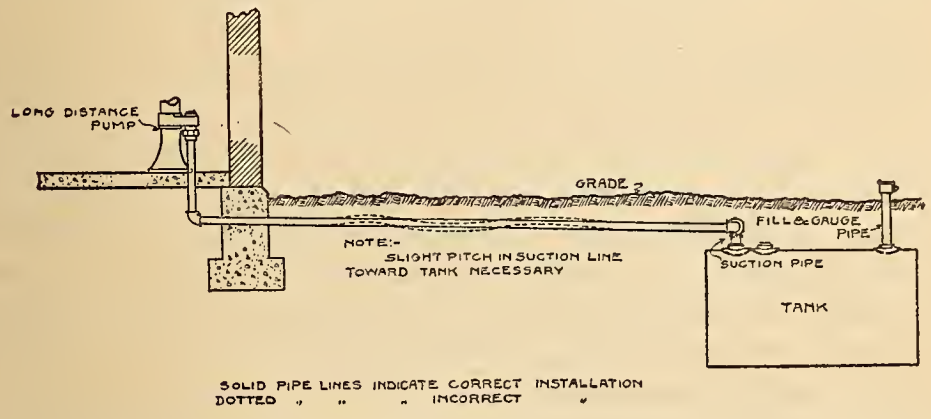

FIG. 19.—*Illustrating correct and incorrect practice in installation of piping. Suction pipe should have a continuous, though not necessarily uniform, pitch from pump back to tank*

and a trigger or snap to hold the crank or handle in place at the initial and final point of the stroke. Such a mechanism will permit adjustment of the discharge to the standard in just as convenient and flexible a manner as those at present employed.

The inspector of weights and measures should exercise a supervision over the ordinary use of piston-type measuring pumps in trade, and satisfy himself that the merchants do not deliver short measure by failure to complete the full stroke. This is a practice which is easy in execution and difficult to establish as a violation of the law, since under some laws intent to defraud is an element of the violation and it is often very difficult to prove that this intent was present. It is the writer's opinion that pumps of the piston type in which incomplete strokes may be performed

should be provided with a placard or sign reading somewhat as follows: THIS PUMP TO DELIVER ____ GALLONS ON EACH FULL STROKE.

A means to fraud which should be guarded against is the by-passing of a portion of the discharge stream back into the supply tank. Any piping connecting the discharge side of the pump to a tank or basin may be looked upon with suspicion. A number of types of measuring-chamber pumps may be so operated as to allow the return of liquid to the supply tank at the same time that the discharge to the customer is taking place. These pumps should be so modified that the operation of returning to the supply tank the liquid stored in the measuring chamber can not be performed except by a mechanical device, the purpose and action of which are clearly perceptible to the purchaser, or, better still, which can not be operated while the regular outlet is open.

A number of instances have come to the writer's attention in which garages have in service a measuring pump which is used merely for filling wheeled tanks or cans and not as a measuring device, unless perhaps as a check on the distribution of gasoline at various selling pumps. In cases of this kind in which the inspector is assured by the owner that the pump will not be used directly in the sale of gasoline to consumers, the pump need not be tested and sealed, provided that steps are taken to insure against its being used as a measuring instrument. This can be simply done by placarding such pumps with a sign reading somewhat as follows: THIS PUMP IS NOT TO BE USED FOR MEASURING PURPOSES.

In no case should the inspector permit a pump to be left uninspected and unsealed, unless some precaution of this kind is taken to prevent its use for measuring purposes.

ROUTINE OF TEST

In testing a measuring pump the hose may often be removed and the test deliveries taken directly from the pipe outlet. In other installations a can-filling outlet is provided; in such cases the valve at the inner end of the hose should be tightly closed, and the test deliveries taken from the can-filling outlet.

Determine first the accuracy of the initial delivery of the pump as found, beginning with the handle in the starting position. The error will be determined in this manner: Have ready a standard measure of capacity equal to the nominal discharge of the pump for each full stroke, if this size measure is available, and

start pumping into the measure at about the normal speed of operation of the pump, intercepting, however, during the process, a portion of the discharge into a straight cylindrical graduate of about 35 cubic inches capacity. When the discharge of the pump is completed, and the operating handle returned to its starting position, see that the standard measure is accurately level, and pour from the graduate into the measure until the latter is exactly full, or until no more liquid remains in the graduate. If the pump is delivering in excess a portion of its discharge will remain in the graduate after the standard measure is exactly filled, and this quantity may be read off as the error of the pump in excess.

If the pump is delivering in deficiency, the amount in the graduate will be insufficient to fill the standard measure, and a suitable amount of liquid in addition may be poured into the graduate from any convenient supply, the reading of the graduate being noted. Then pour from the graduate into the standard measure until the latter is exactly filled, and again read the quantity of liquid in the graduate. This value subtracted from the reading of the graduate just taken will be the error of the pump in deficiency.

The set of readings taken as above will determine the error of the pump as found. Now, readings may be taken to determine the action of the pump when operating under the conditions of service. Proceed in the manner above described, operating the pump at a slow speed for one determination, and at high speed for the next determination, noting the error in each case. If either of the determinations just described is in error in excess of the tolerance allowable, the pump should be recommended for repair or adjustment. The two speeds used for the tests just outlined should be considerably different, one faster than normal operation and one slower than normal operation. Neither speed, however, should be greatly outside the range which may be expected to occur in actual use of the pump.

Slicker plates may or may not be used in the work with the test measure, according to the precision desired. The use of slicker plates will undoubtedly give better results, and will serve to impress observers with the need for care and accuracy in this work.

A simple and useful form of testing standard, which can be constructed in the 1 and 5 gallon sizes, will serve all the ordinary purposes of field testing of measuring pumps. This graduate is

shown in Fig. 22. By using this measure, the design of which is due to Theo. Seraphin, of the office of the county commissioners, Philadelphia, the determination of the error of delivery for all ordinary ranges of error becomes merely a matter of reading off the height of the liquid surface on the graduated scale of cubic inches shown. This measure can be readily hung upon the delivery tap of the pump, or it can be set upon the floor under the pump, as circumstances may dictate. While this measure is not at present on the market, it can doubtless be constructed to order

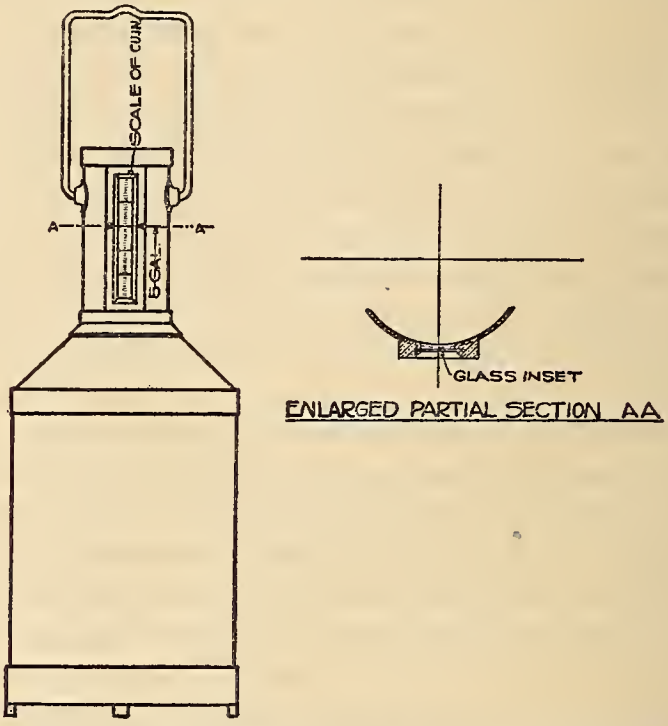

FIG. 22.—*Seraphin type of testing measure for field use, graduated for direct determination of excess or deficiency within the ordinary range encountered*

at a moderate price by any one of a number of firms making similar apparatus.

If a measuring pump is in good mechanical condition, and its design and installation are not grossly incorrect, the amount of liquid delivered should be nearly, if not quite, independent of the speed at which it is operated, at least over all ranges of speed which are practicable for manual operation. Exception should be noted, however, to this statement, in those cases in which the storage tank is so far below the cylinder of the pump that excessive reduction of pressure accompanied by volatilization occurs in the liquid column when the piston is rapidly operated. This

FIG. 20.—*Testing with a 5-gallon standard, slicker plate, and graduated cylinder. A conical 1-gallon measure is seen at the left*

FIG. 21.—*In testing outfits which have a low hose connection, care must be taken to insure drainage to a constant level if complete drainage of the hose is not feasible. In this illustration the inspector is supporting the discharge cock at the level of the top of his standard measure. A stand or support might well be supplied for use in such cases. Note that the pump in the background must force the measured liquid through a long pipe line under the sidewalk*

effect is heightened by the presence of excessive resistance in the suction line, such as will be consequent upon the presence of numerous elbows and valves, excessive length of suction piping, or constrictions in the pipe.

The inspector should assure himself by trial that the counter or tallying device, whatever its type, gives correct indications. He should see that it does not skip any numbers as the pump is operated and that it does not fail to advance one number for each complete cycle of operation. If the counter is found to be unreliable, it should be removed, or else deranged in such a manner that it does not indicate at all, pending the performance of proper repairs.

The inspector may require that the counter be clearly visible to both the customer and the operator, and that its indications be legible and not obliterated by dirt or wear. There is an increasing and commendable tendency for manufacturers to increase the size and legibility of the counters, and to place them in positions where their indications can be more easily observed.

The integrating counters with which many pumps are fitted are not of paramount interest or importance to the inspector of weights and measures, since their indications figure principally in the dealer's computation of his profits, losses, and sales, and do not directly affect the purchases of the liquid commodity. However, such counters sometimes go amiss, and lead to false conclusions on the part of the dealer. Where such counters are shown on actual trial by counting of strokes to be reading incorrectly, they should be sent to the makers of the pump or their agents for repair.

A number of cases have been noted in which there was an actual siphoning of gasoline from the tank or from the filter chamber. Such siphoning is particularly likely to occur in the case of the wheeled tank, due to the fact that the end of the hose can be brought to a point below the level of the liquid in the tank; the difference in head resulting is sometimes sufficient to raise the lift valves in the system and discharge a continuous stream without operation of the pump. In the case of stationary pumps with tanks below grade, a similar action can occur by infiltration of air through a point of leak at any place above the height of outlet. Some makers have eliminated the siphoning by introducing into the discharge piping a spring check valve, which will not open except under the relatively high pressure occurring during the actual operation of the piston. Such a valve is desirable from

the point of view of safety as well as from its effect in reducing the likelihood of excess delivery from the causes just outlined.

This siphoning action should not be confused with the gradual spillage which is often noted as a result of the expansion of the liquid in the pump chambers, due to an increase in temperature by conduction through the cylinder walls, this action sometimes occurring when gasoline is brought from a tank in which it is kept relatively cool to a warmer region outside.

In connection with this topic of thermal expansion it is to be noted that cases of short delivery are sometimes explicable on the basis of contraction of volume of the liquid contained in the pump due to a fall in temperature, as from evening to the next morning. This contraction in volume will amount to about 0.1 per cent for 1° C. It is unavoidable in the nature of things and suggests again the need of pumping through a quantity of gasoline before the pump is used for measurement after a period of disuse.

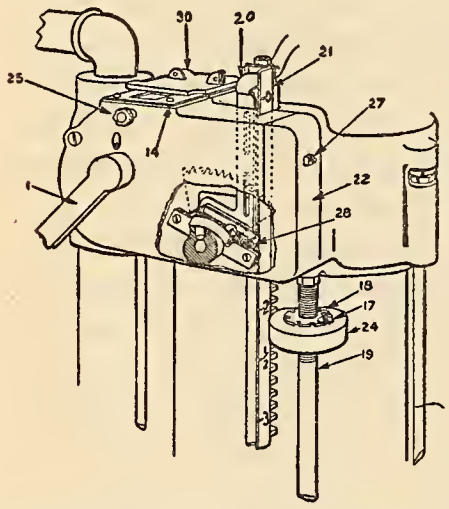

FIG. 26.—*The stop on this pump is sealed by inserting a lead seal into a hole in the upper end of the pin passing through washer No. 17*

SEALING

After the pump has been tested and found correct, or has been adjusted by the inspector so as to deliver correctly the indicated amount of liquid on repeated trials, it should be sealed. On account of the great diversity in the types and details of construction of the many pumps on the market, it will be impossible in the space available fully to cover the methods of sealing each of the forms of measuring pumps; we must be content to lay down a general principle and illustrate it by a few examples.

Obviously, a seal should be applied to every accessible part of the pump upon which an adjustment can be made which would directly affect the amount of liquid delivered. In the piston type of pump this will always require the individual sealing of the several piston limit stops; if the stop bar is threaded to permit the rotation of the stops for the purpose of primary adjustment, the alteration of the setting of the stops can be prevented by sealing in place the rod which limits the rotation of the stops upon the threaded bar. This rod can be clearly seen in Fig. 25.

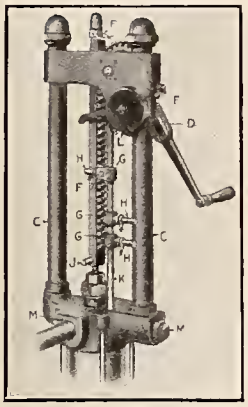

FIG. 23.—*For sealing stops like those shown above, seals must be passed through holes in the screws marked* H *so as to engage with the slots or kerfs cut into the cast lugs in which these screws are supported*

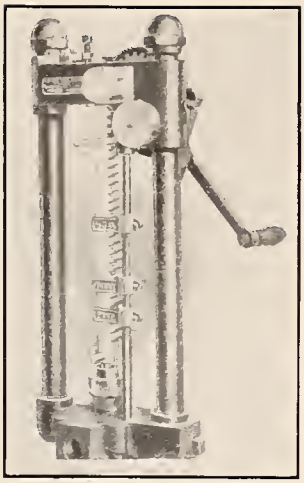

FIG. 24.—*In this type the piston stops are split vertically and may be made secure against alteration by passing a seal through one end of the screws which hold together the two halves of the stop*

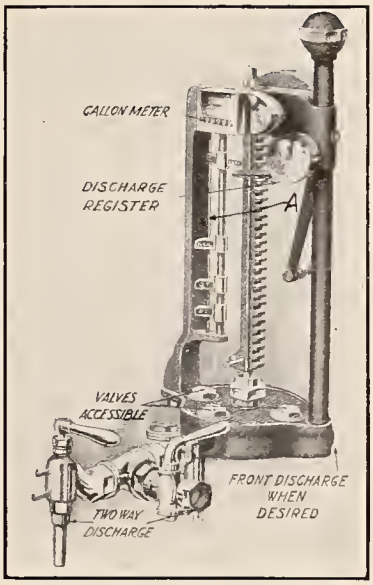

FIG. 25.—*In this type the alteration of the stops is prevented by a vertical rod* A *which prevents the stops from being moved up or down along the screw. To secure them against alteration it is only necessary to seal in place the vertical rod* A; *provision for such sealing being usually made at its lower end*

In one make of pump the limit stops, instead of coacting with the piston rod itself, are carried upon a gear wheel meshing with a rack which forms an extension of the piston rod, as shown in Fig. 27. These stops are usually set screws threaded through cast lugs projecting from the face of the gear wheel. In order to seal stops of this type it will be necessary either to drill straight through the lugs and their contained screws, and pass the wire seal through this hole, or to seal in place the cover of the case in which the gear is contained, in such manner as to prevent effectually all access to the adjustable parts.

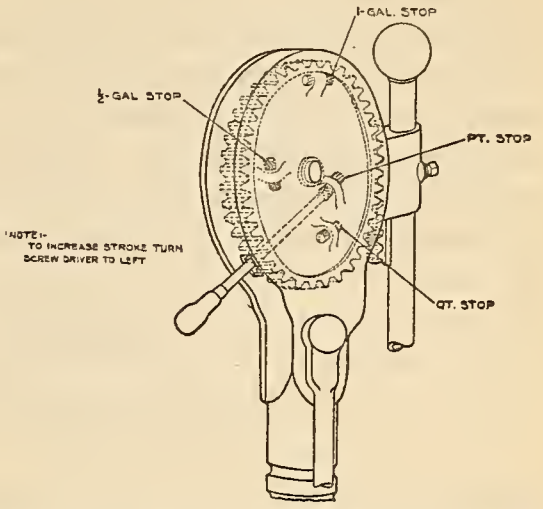

FIG. 27.—*The adjustments of this type are usually secured by sealing shut the case inclosing the gear. If this can not be done, or if there are slots in the gear case through which the screws may be reached from the outside, holes should be drilled through the set screws in the interior of the case and the usual seal wires passed through these holes to prevent the screws from being moved*

The type of piston stop in which the security and permanence of the fastening depends upon the friction of a set screw upon a smooth rod can not be considered satisfactory. Sealing of this type of stop by a metal cap designed to make the head of the set screw inaccessible does not provide sufficient security, and the only safe recourse is to drill completely through the lug and stop bar, driving in a tightly fitting headed pin, passing the usual wire seal through a hole in the unheaded end of the pin.

Care should be taken in all cases to attach seals in such a manner that they can not interfere with the proper operation of the pump. The wires should be drawn up short so that the lead seal lies snugly against the part secured.

The seals used for measuring pumps should be of a strong, heavy type; exposure of the pump to out-of-doors conditions and to hard use and abuse requires the use of seals having heavy tinned braided wires and a lead disk large enough to afford secure clamping of the ends of the wire.

RECORDS

While the writer realizes the difficulties which frequently confront the weights and measures inspector in testing and supervising a large amount of apparatus with a limited force, it is his opinion that the best results are to be obtained only by keeping rather full and detailed records of inspections. By so doing the inspector will develop a quicker and keener faculty of observation and will grow to be more thorough in the work. Moreover, the offering of such complete and explicit data in hearings and in court will not fail to be impressive and convincing, and will enable the administrative officer to deal more surely and expeditiously with violations which may occur. The following form is suggested as one which has been used in extensive field work; it will be found to comprise most of the information which will be required in the routine inspection and testing of measuring pumps. It is of course subject to such modification as may be needed to bring it into conformity with particular needs.

Test of Liquid-Measuring Pump Test No. ——

City.....
Date.....

Owner.....Address.....
Maker of apparatus.....Inspector.....
Type of apparatus.....Maker's No. .....
Nominal delivery per stroke.....gal.
Graduation of meter, measuring cylinder, gauge glass or counter.....gal. x .....gal.
Selling price of commodity on date: .....c. a gal.
Hose length.....feet. Hose diameter, internal, ...inches.

Number of observation	Speed [a]	Nominal discharge	Error (+ or −)	Within tolerance	Without tolerance	Remarks
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						

Is hose high enough to insure satisfactory drainage? .....
Does counter operate correctly? .....
Other notes.....
.....
.....
Test full stroke as found and after use.
Test or remove fractional stops.

[a] Slow, normal, or fast; or give, in seconds, time required for stroke.

CONDITION OF PUMPS IN SERVICE

Of 79 measuring systems of various types chosen at random and tested by the writer in a number of different cities, 55, or 70 per cent, had errors in excess of the tolerance allowable, and 24, or 30 per cent, had errors within the tolerances. In addition, there were eight outfits so constructed as to be absolutely unsuited for retail liquid dispensing. Of the 55 out of tolerance 80 per cent gave deliveries in deficiency and 20 per cent in excess. This tendency toward deficient measurement is worthy of careful consideration, and it is only proper to call attention to the fact that most of the causes of error in measuring-pump operation tend toward the side of deficient delivery.[1] Among these may be mentioned leaks, retention of liquid by the hose, excessive virtual suction head, resulting in vaporization and other losses, failure to complete the full stroke, and slippage.

CONCLUSION

The results of this investigation will be placed at the disposal of the tolerance committee of the conference and will form the basis for such specifications as may be required in the normal progress in this field. Suitable specifications suggested by the results of this work will probably be presented at the next annual conference, and in the interim the Bureau will treat particular inquiries from weights and measures officials and manufacturers in the light of the best information now in hand.

The Bureau will endeavor to maintain a full and up-to-date mailing list of the makers of measuring pumps, and will strive to keep in touch with current progress in the design of this apparatus.

Thanks are due a number of city weights and measures officials who gave valuable aid in the work of this investigation, and to manufacturers of measuring pumps generally, who in a gratifying manner furnished drawings and other data and afforded the writer an opportunity to visit their factories and study the methods of manufacture.

WASHINGTON, June 30, 1916.

[1] Since the above was written, a great amount of additional field work has been done and the results show conditions generally to be in serious need of correction by thorough and regular supervision. The results of these later investigations will soon be available in the form of a circular, which will be sent to those who request it.